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## PROGRAM MANAGER RMA CONTAMINATION CLEANUP

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### COMPREHENSIVE MONITORING PROGRAM

Contract Number DAAA15-87-0095

ANNUAL GROUND WATER REPORT FOR 1989  
JUNE 1990

FINAL REPORT

Version 2.0

Volume II **Rocky Mount**

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**ANNUAL GROUND WATER REPORT FOR 1989  
JUNE 1990**

**FINAL REPORT**

Version 2.0

Volume II

**Rocky Mountain Arsenal  
Information Center  
Commerce City, Colorado**

Prepared by:

**R. L. STOLLAR & ASSOCIATES INC.  
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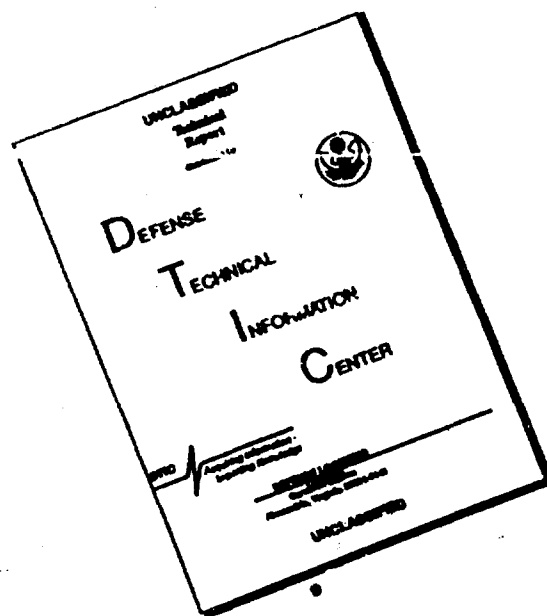
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(on diskette - enclosed)

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DURING FY89

## LIST OF ACRONYMS

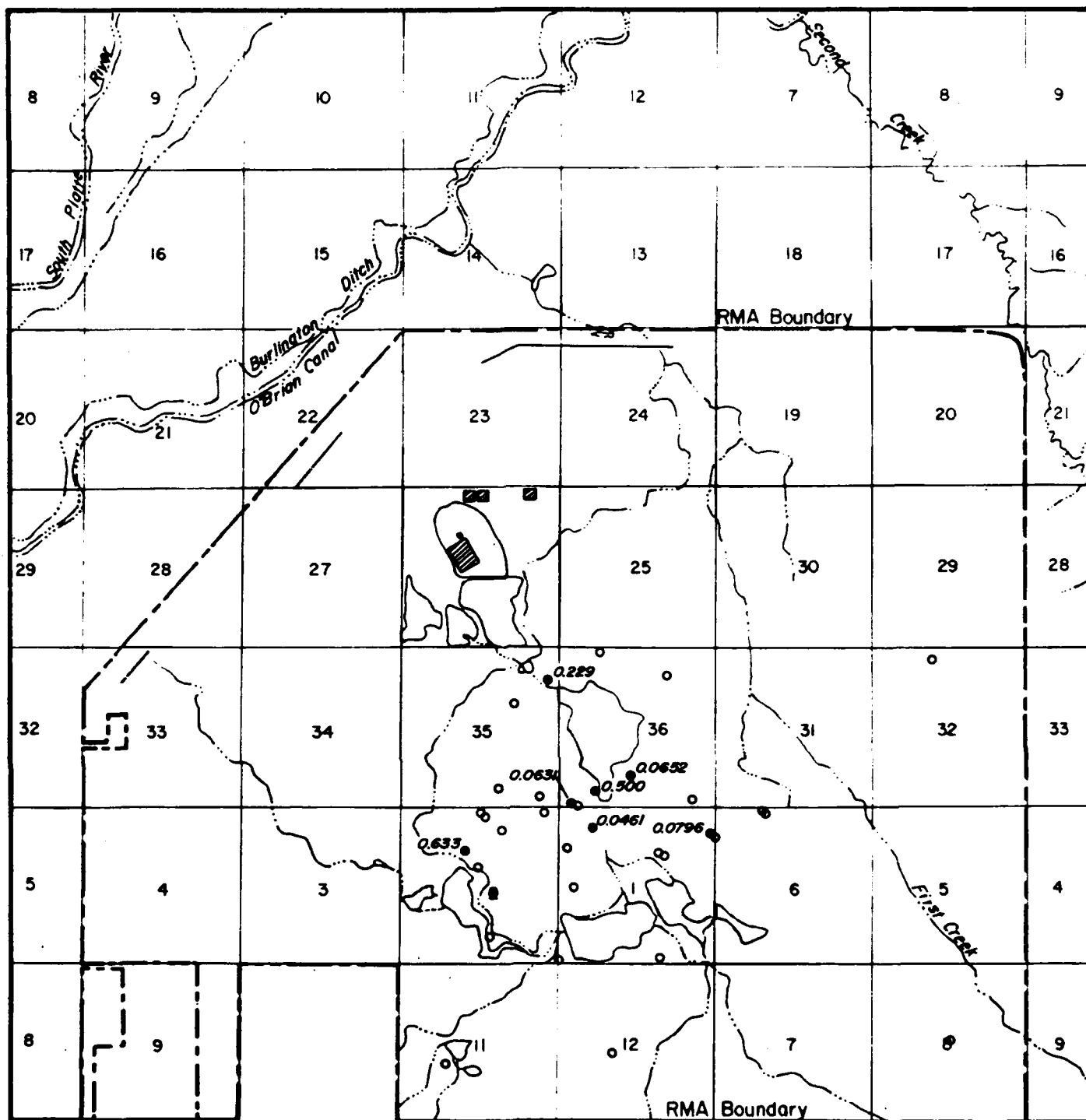
### ACRONYMS AND ABBREVIATIONS

Chlordane	1,2,4,5,6,7,8,8-octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene
C <sub>6</sub> H <sub>5</sub> Cl	Chlorobenzene
CMP FY88	Comprehensive Monitoring Program Fiscal Year 1988
CO	Carbon Monoxide
DBCP	Dibromochloropropane
DCLE11	1,1-Dichloroethane
DCLE12	1,2-Dichloroethane
DCPD	Dicyclopentadiene
DDD	Dichlorodiphenyldichloroethane
DMB12	Dimethylbenzene
DMDS	Dimethyl Disulfide
EPA	Environmental Protection Agency
ETC <sub>6</sub> H <sub>5</sub>	Ethylbenzene
GC/MS	Gas Chromatography/Mass Spectrometry
GC/ECD	Gas Chromatography/Electron Capture Detection
ICAP	Inductively Coupled Argon Plasma
Malathion	0,0-dimethyl-s-(1,2-dicarboxyethyl) phosphorodithioate
MIBK	Methyl Isobutyl Ketone
Parathion	Parathion (C <sub>10</sub> H <sub>14</sub> NO <sub>5</sub> PS)
PMRMA	Program Manager Rocky Mountain Arsenal
PPDDE	Dichlorodiphenylethane
PPDDT	Dichlorodiphenyltrichloroethane
SO <sub>2</sub>	Sulfur Dioxide
Supona	2-chloro-1-(2,4-dichlorophenyl) vinyl diethyl phosphate
T12DCE	Trans-1,2-Dichloroethene
TCLEE	Tetrachloroethene
TRCLE	Trichloroethene
USATHAMA	U.S. Army Toxic and Hazardous Materials Agency
XYLENE	Xylene

**APPENDIX A**

**MAPS SHOWING DISTRIBUTIONS OF CONTAMINANTS**

**IN THE CONFINED FLOW SYSTEM**



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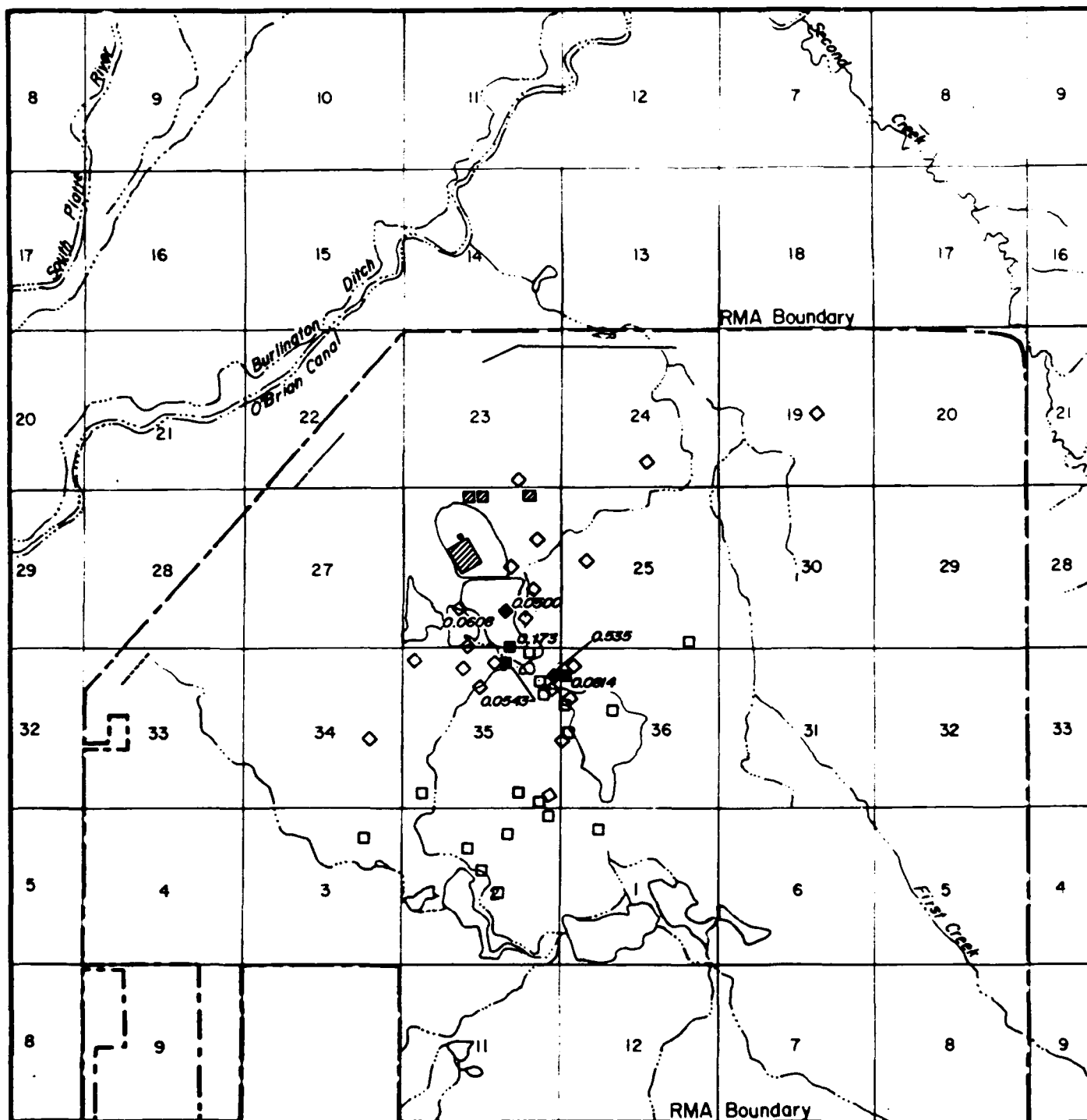
Prepared by:

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Harding Lawson Associates

Figure A-1

**Dieldrin Detections  
Denver Zone A  
Fall 1988**

**CMP GVAR FY89**



### Explanation

- 0.173 Denver Zone 1U Well Location
- ◆ 0.0814 Denver Zone 1 Well Location
- ▨ Basin F IRA Structure
- Containment System
- Physical Barrier
- Hydraulic Barrier

Analyte Concentration in µg/l

Note : Open symbol  
Indicates analyte  
was not detected

0 5000 10,000 Feet  
0 1000 2000 3000 Meters

Prepared for :

U.S. Army Program Manager for  
Rocky Mountain Arsenal  
Commerce City, Colorado

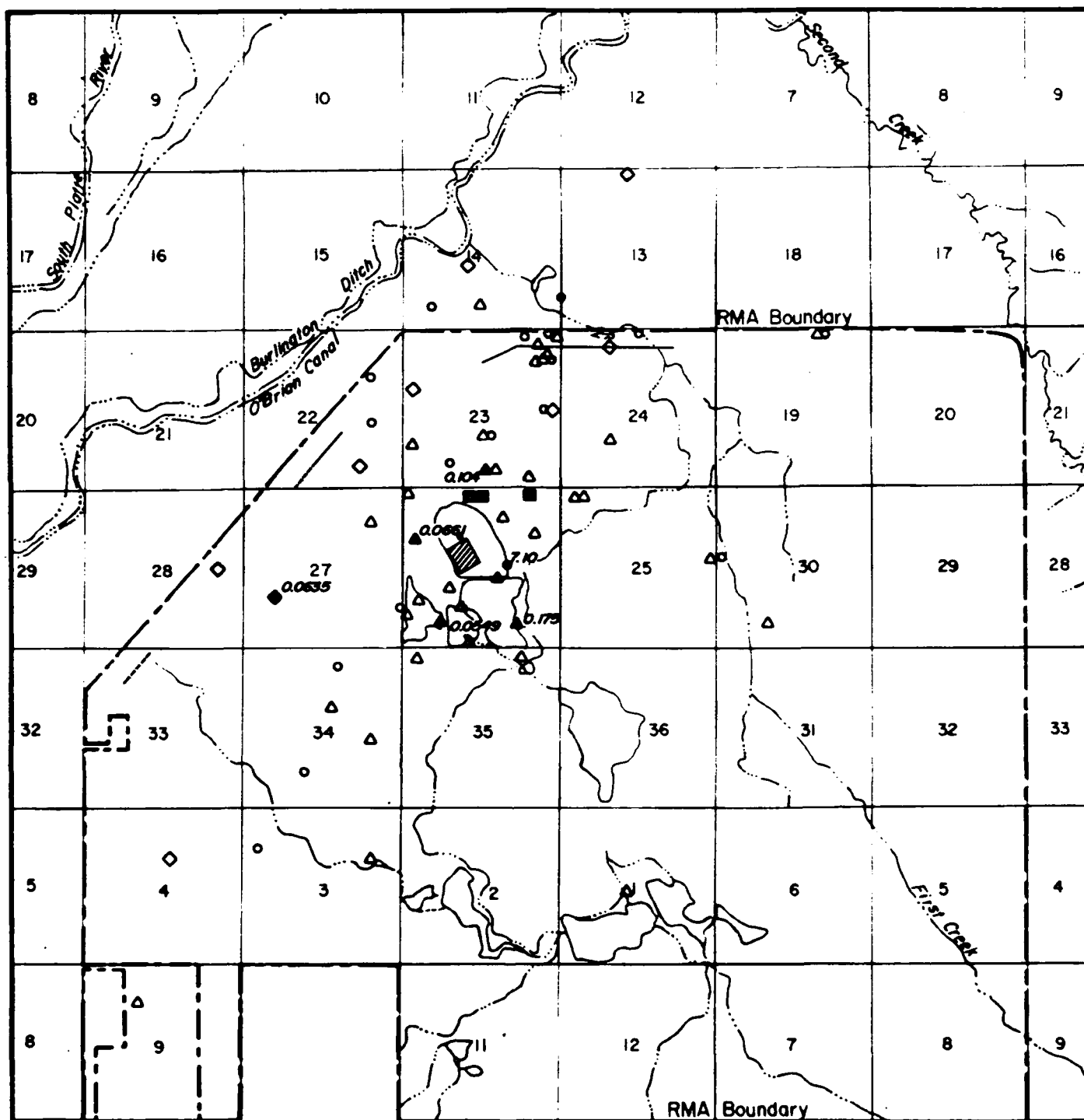
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Harding Lawson Associates

Figure A-2

Dieldrin Detections  
Denver Zones 1U & 1  
Fall 1988

CMP GVAR FY88



### Explanation

- ▲ 0.175 Denver Zone 2 Well Location
- 7.10 Denver Zone 3 Well Location
- ◆ 0.0635 Denver Zone 5 Well Location

- Containment System
- Physical Barrier
- Hydraulic Barrier

Analyte Concentration in  $\mu\text{g/l}$

Note : Open symbol  
Indicates analyte  
was not detected

▣ Basin F IRA  
Structure



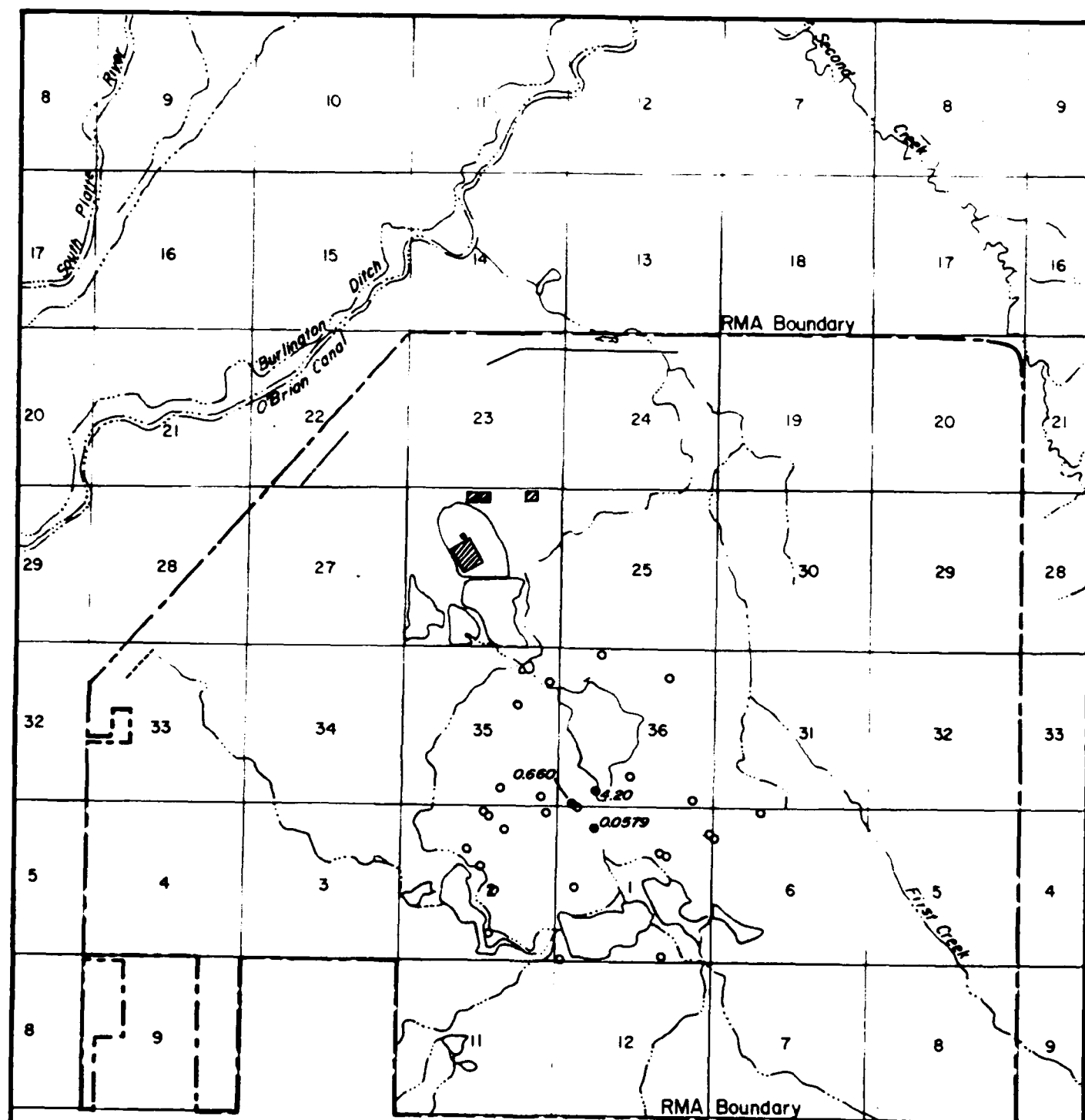
0 5000 10,000 Feet  
0 1000 2000 3000 Meters

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Commerce City, Colorado  
Prepared by :  
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Harding Lawson Associates

Figure A-3

Dieldrin Detections  
Denver Zones 2, 3 & 5  
Fall 1988  
CMP GVAR FY89





### Explanation

● 4.20 Denver Zone A Well Location

— Containment System

— Physical Barrier

— Hydraulic Barrier

▣ Basin F IRA Structure

Analyte Concentration in  $\mu\text{g/l}$

Note: Open symbol  
Indicates analyte  
was not detected

0 5000 10,000 Feet  
0 1000 2000 3000 Meters

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Commerce City, Colorado

Prepared by:

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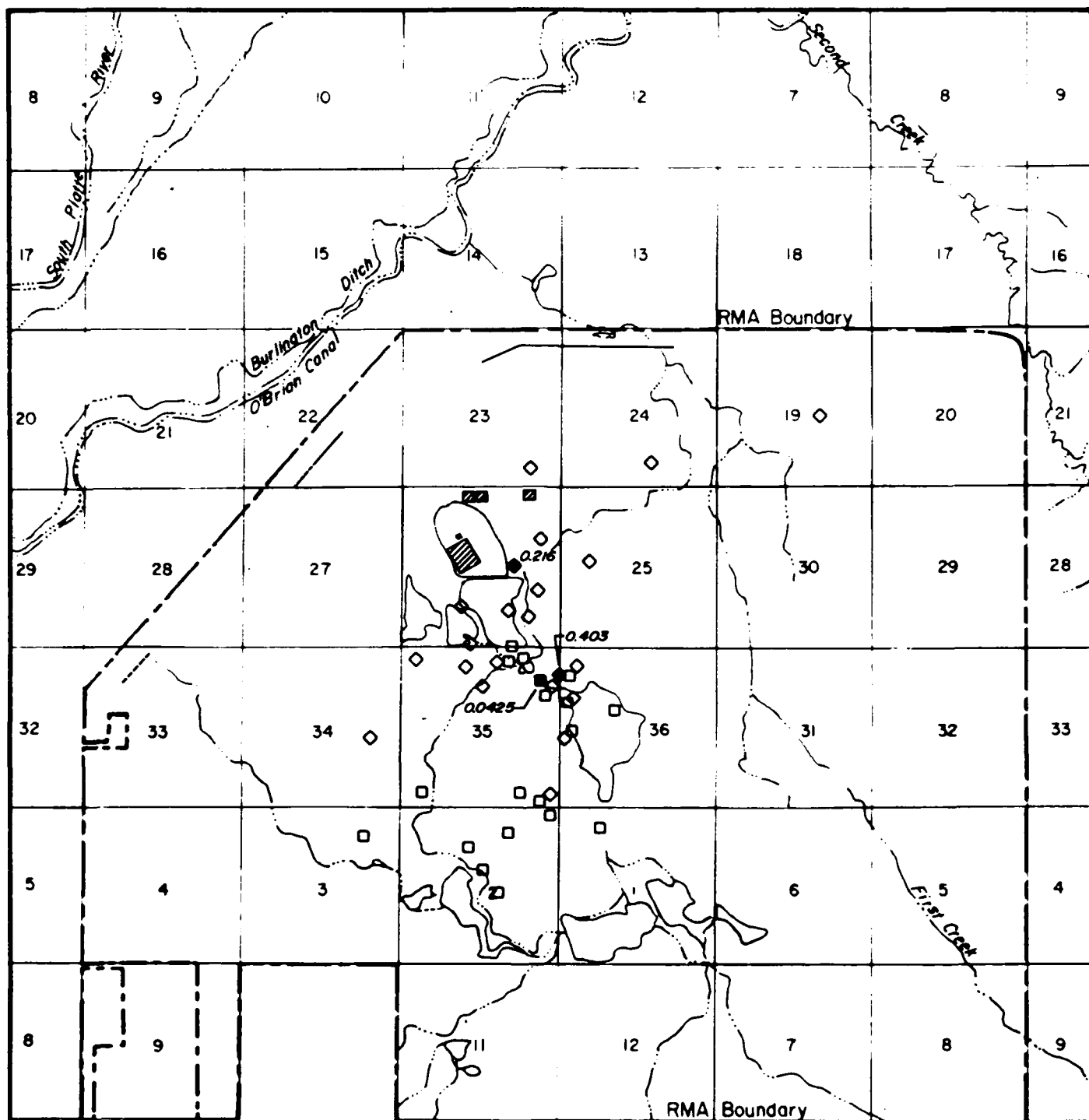
Figure A-4

Endrin Detections

Denver Zone A

Fall 1988

CMP GVAR FY89



### Explanation

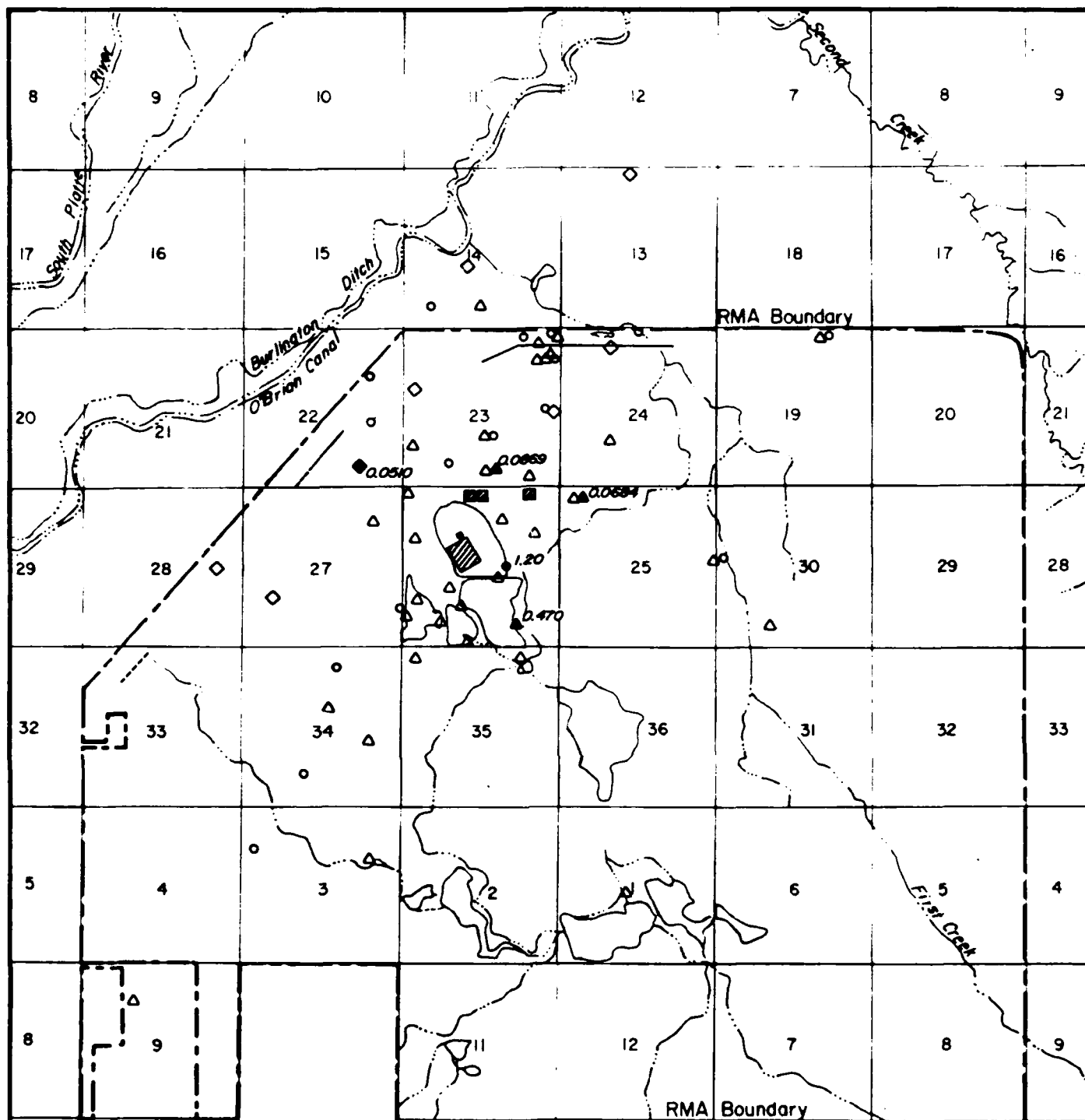
- 0.0425 Denver Zone 1U Well Location
  - ◆ 0.216 Denver Zone 1 Well Location
  - ▣ Basin F IRA Structure
  - Containment System
  - Physical Barrier
  - Hydraulic Barrier
- Analyte Concentration in  $\mu\text{g/l}$
- Note : Open symbol  
Indicates analyte was not detected

0 5000 10,000 Feet  
0 1000 2000 3000 Meters

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U.S. Army Program Manager for  
Rocky Mountain Arsenal  
Commerce City, Colorado

Prepared by:  
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Figure A-5  
Endrin Detections  
Denver Zones 1U & 1  
Fall 1988  
CMP GWAR FY89



### Explanation

- ▲ 0.0684 Denver Zone 2 Well Location
- 1.20 Denver Zone 3 Well Location
- ◆ 0.0510 Denver Zone 5 Well Location

- Containment System
- Physical Barrier
- Hydraulic Barrier

Analyte Concentration in  $\mu\text{g/l}$

Note: Open symbol  
indicates analyte  
was not detected

▨ Basin F IRA  
Structure



0 5000 10,000 Feet  
0 1000 2000 3000 Meters

Prepared for:

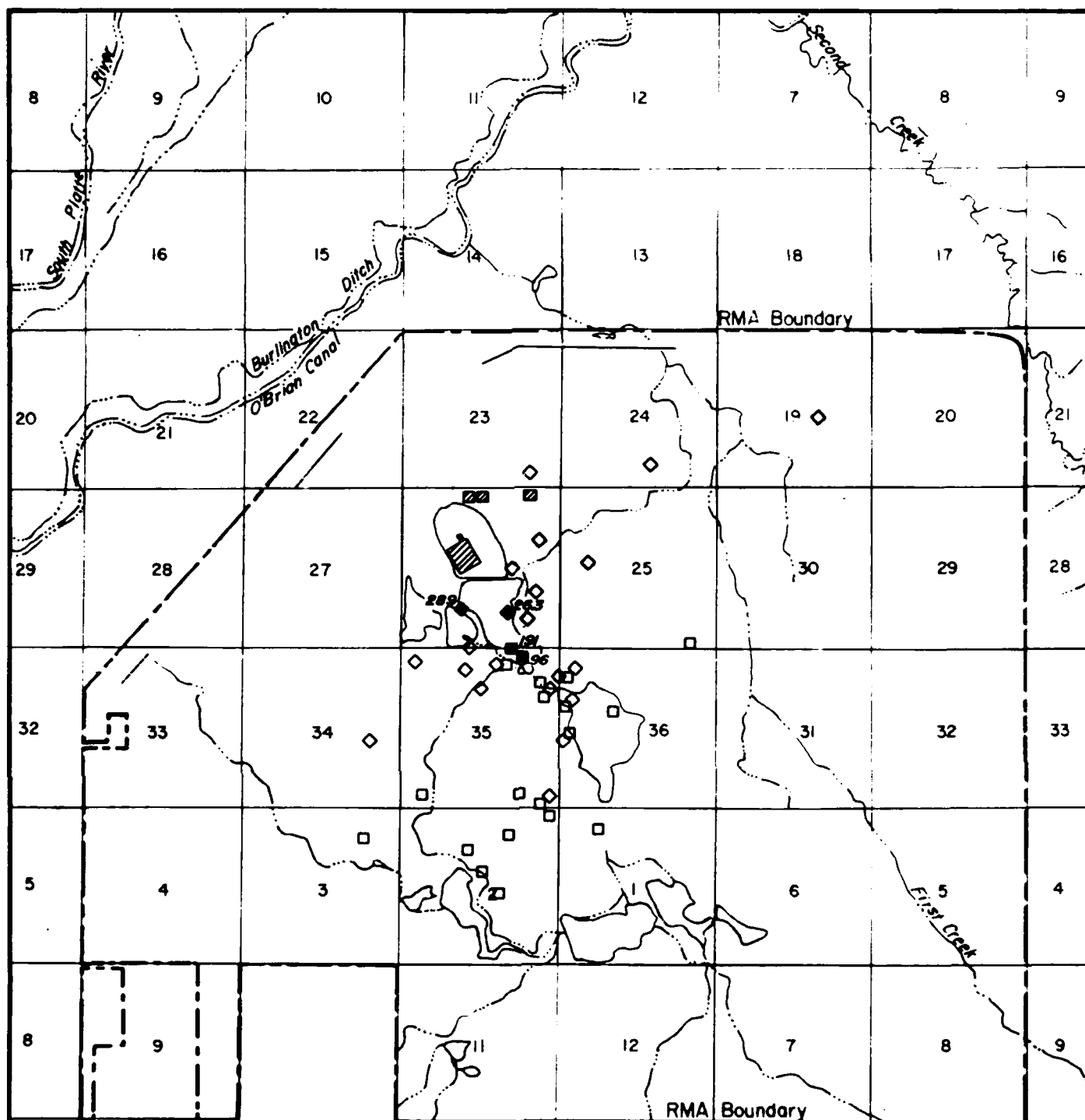
U.S. Army Program Manager for  
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Figure A-6

Endrin Detections  
Denver Zones 2, 3, & 5  
Fall 1988  
CMP GWAR FY89



### Explanation

- 191 Denver Zone 1U Well Location
- ◆ 289 Denver Zone 1 Well Location
- ▣ Basin F IRA Structure
- Containment System
- Physical Barrier
- Hydraulic Barrier

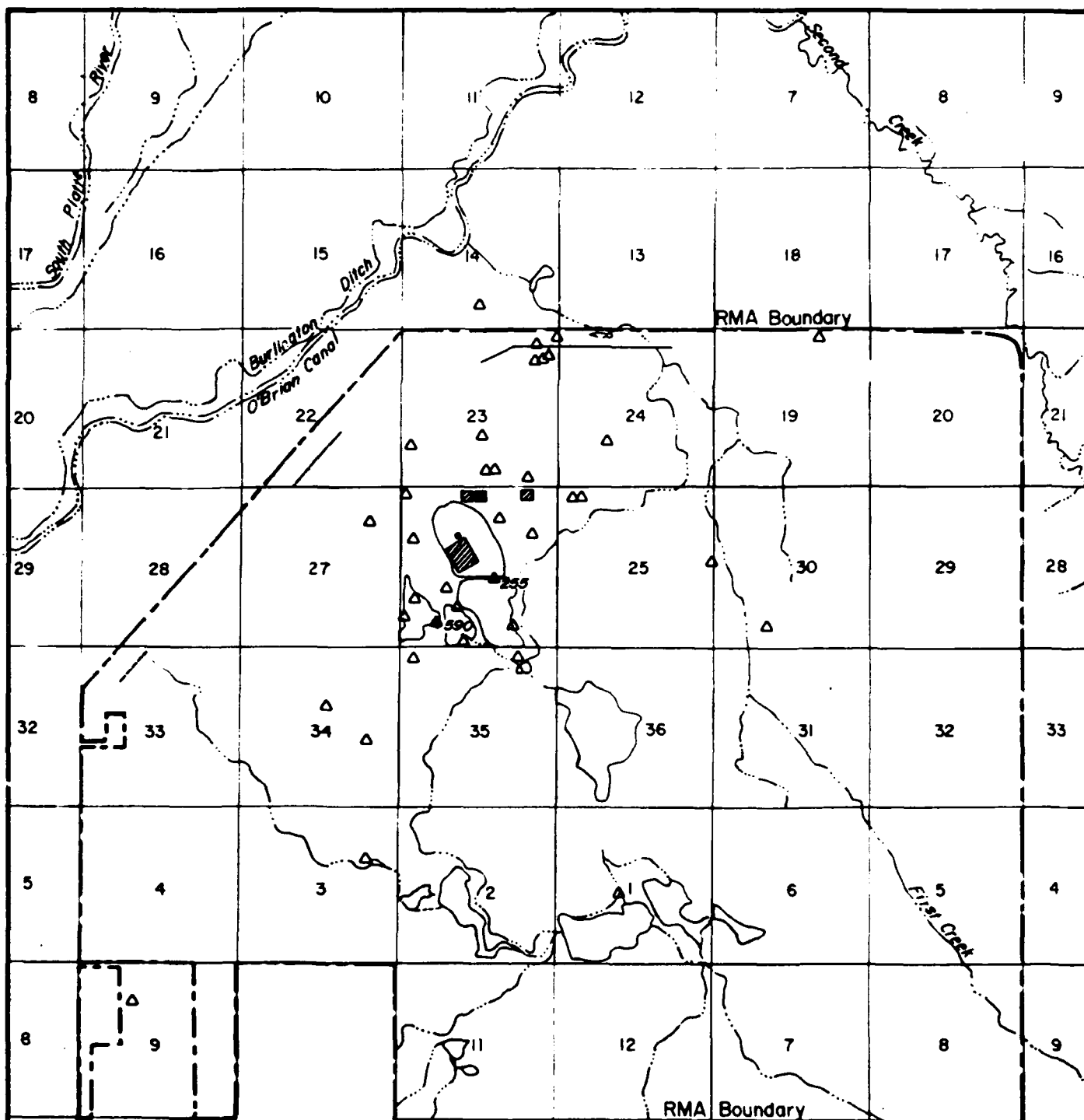
Analyte Concentration in  $\mu\text{g/l}$

Note : Open symbol  
Indicates analyte  
was not detected

0 5000 10,000 Feet  
0 1000 2000 3000 Meters

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Prepared by :  
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Figure A-7  
Dithiane/Oxathiane  
Detections  
Denver Zones 1U & 1  
Fall 1988  
CMP GVAR FY89



### Explanation

▲<sup>255</sup> Denver Zone 2 Well Location

— Containment System

— Physical Barrier

— Hydraulic Barrier

■ Basin F IRA Structure

Analyte Concentration in  $\mu\text{g/l}$

Note: Open symbol  
Indicates analyte  
was not detected

0 5000 10,000 Feet  
0 1000 2000 3000 Meters

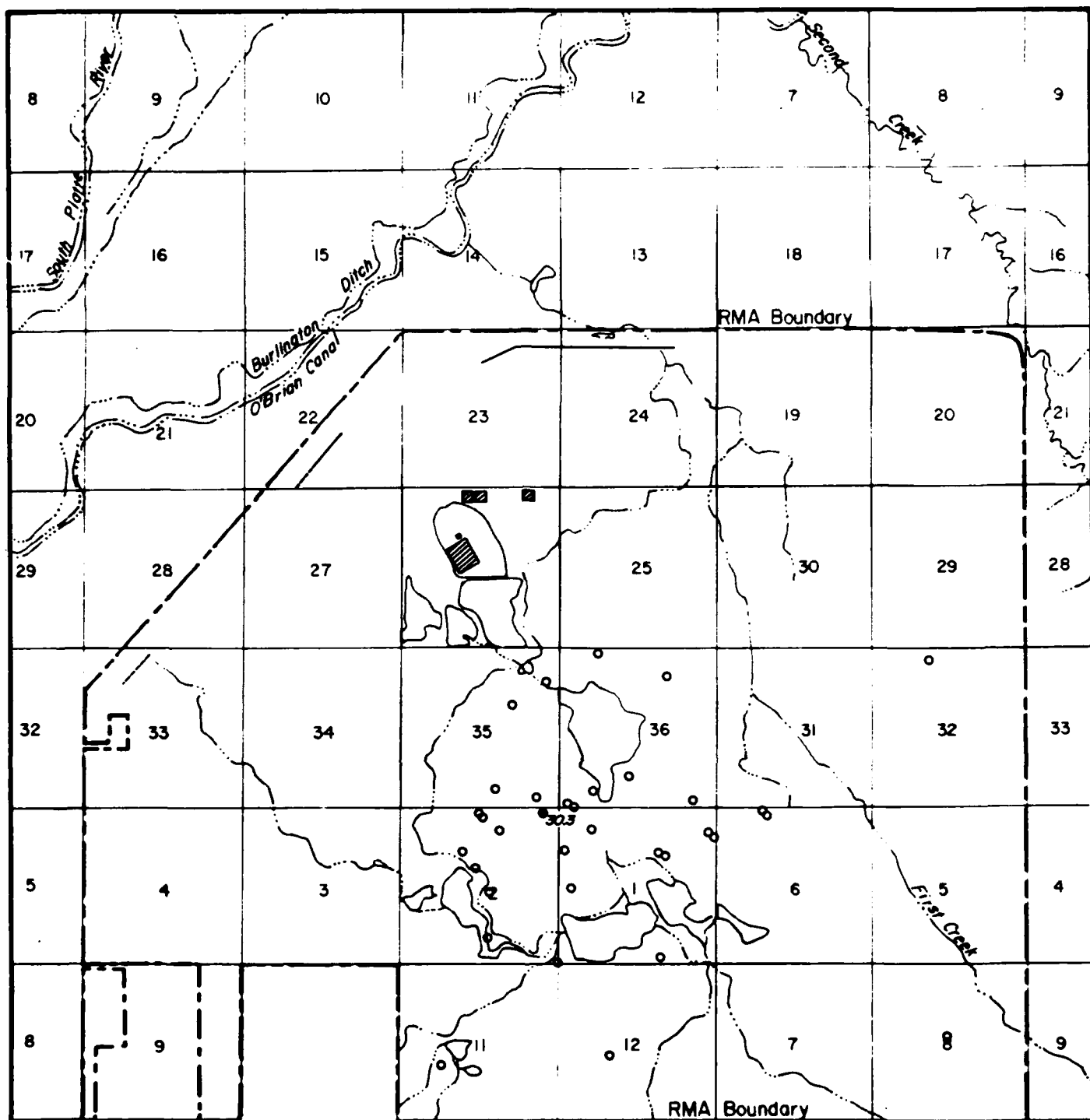
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Commerce City, Colorado

Prepared by:

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Figure A-8  
Dithiane/Oxathiane  
Detections  
Denver Zone 2  
Fall 1988  
CMP GVAR FY89



### Explanation

● 30.3 Denver Zone A Well Location

— Containment System

— Physical Barrier

— Hydraulic Barrier

▨ Basin F IRA Structure

Analyte Concentration in  $\mu\text{g/l}$

Note: Open symbol  
indicates analyte  
was not detected

0 5000 10,000 Feet  
0 1000 2000 3000 Meters

Prepared for:

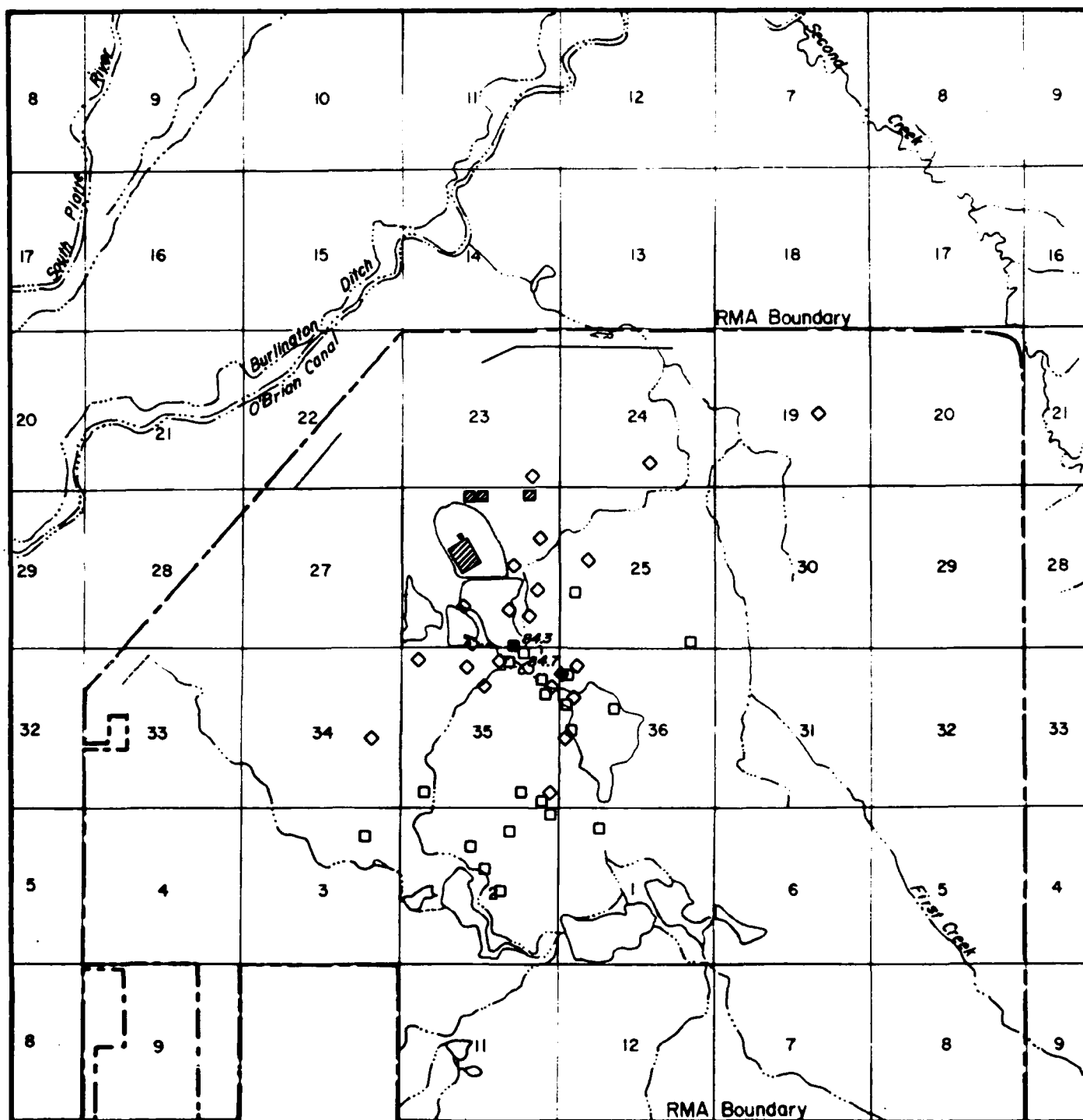
U.S. Army Program Manager for  
Rocky Mountain Arsenal  
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Figure A-9

Summed Organosulfur  
Compound Detections  
Denver Zone A  
Fall 1988  
CMP GWAR FY89



### Explanation

- 04.3 Denver Zone 1U Well Location
- ◆ 04.7 Denver Zone 1 Well Location
- ▣ Basin F IRA Structure
- Containment System
  - Physical Barrier
  - Hydraulic Barrier

Analyte Concentration in  $\mu\text{g/l}$

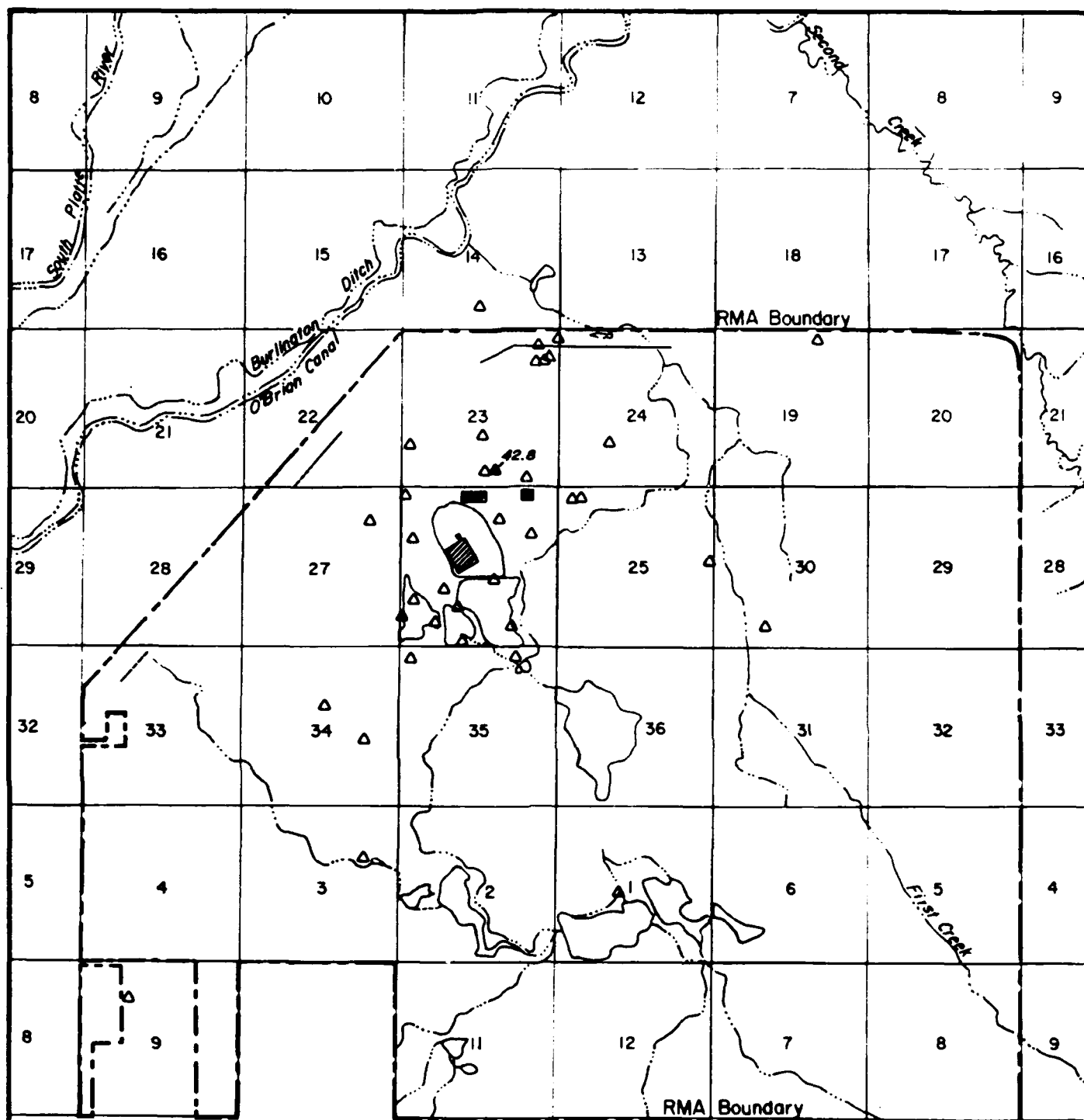
Note: Open symbol  
indicates analyte  
was not detected

0 5000 10,000 Feet  
0 1000 2000 3000 Meters

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Figure A-10  
Summed Organosulfur  
Compound Detections  
Denver Zones 1U & 1  
Fall 1988  
CMP GWAR FY89



### Explanation

▲<sup>42.8</sup> Denver Zone 2 Well Location

— Containment System  
 — Physical Barrier  
 — Hydraulic Barrier

▣ Basin F IRA Structure

Analyte Concentration in  $\mu\text{g/l}$

Note: Open symbol  
 indicates analyte  
 was not detected

0 5000 10,000 Feet  
 0 1000 2000 3000 Meters

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 Rocky Mountain Arsenal  
 Commerce City, Colorado

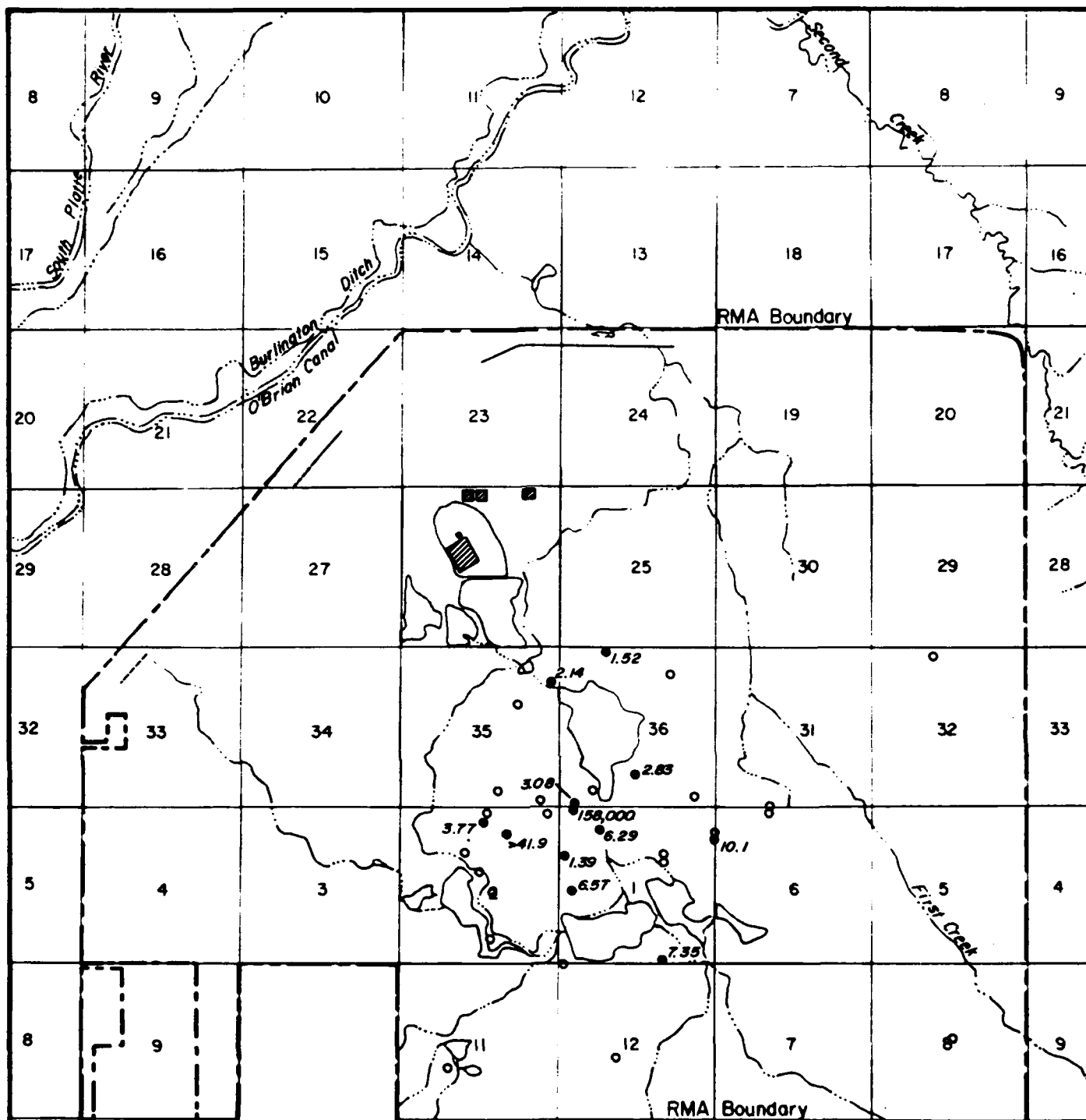
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Figure A-11

Summed Organosulfur  
 Compound Detections  
 Denver Zone 2  
 Fall 1988  
 CMP GWAR FY89





### Explanation

● 1.52 Denver Zone A Well Location

— Containment System  
 — Physical Barrier  
 - - Hydraulic Barrier  
 □ Basin F IRA Structure

Analyte Concentration in µg/l

Note: Open symbol  
 indicates analyte  
 was not detected

0 5000 10,000 Feet  
 0 1000 2000 3000 Meters

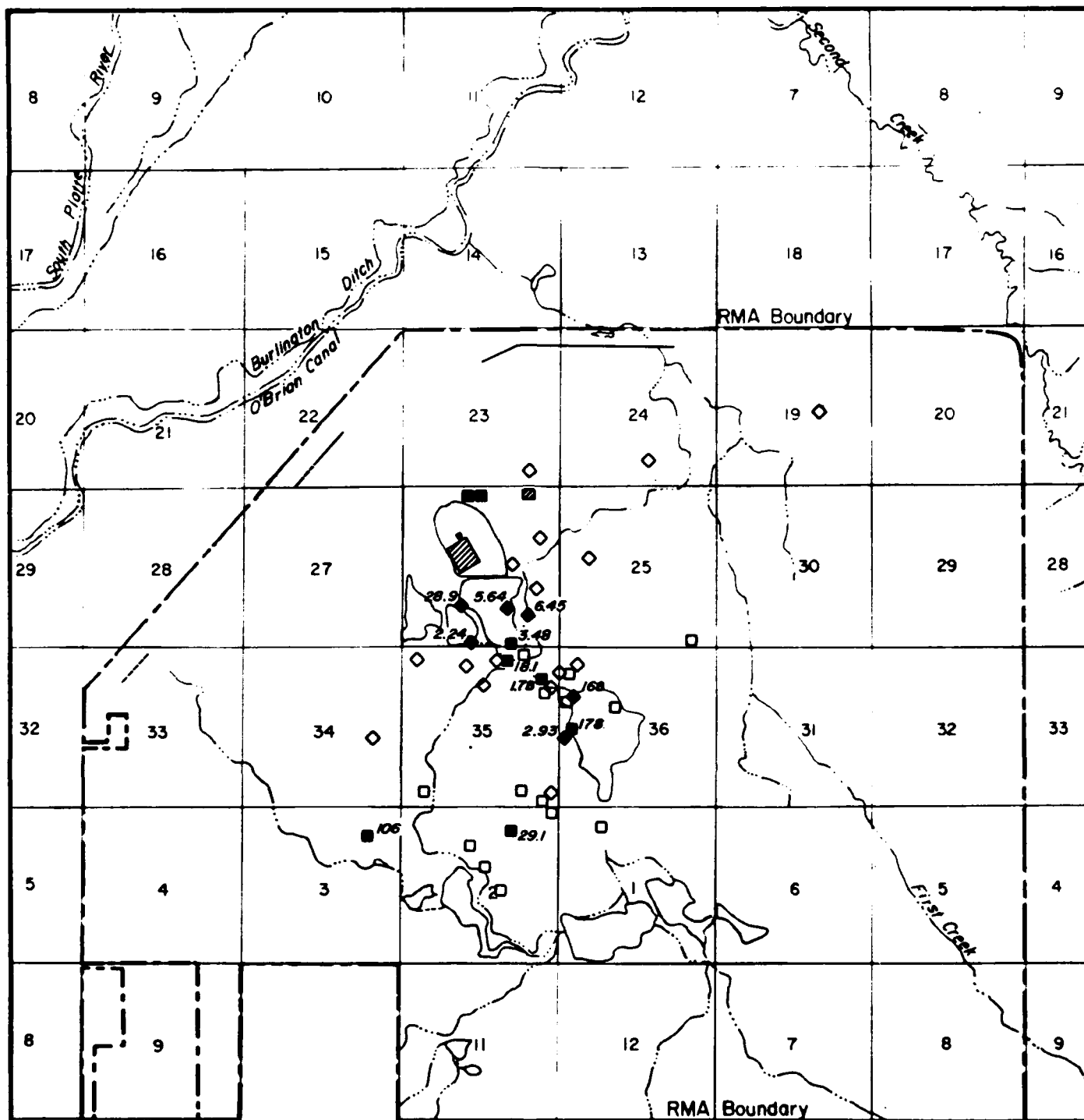
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Figure A-12  
 Summed Volatile Aromatic  
 Compound Detections  
 Denver Zone A  
 Fall 1988  
 CMP GWAR FY89



### Explanation

- 3.48 Denver Zone 1U Well Location
- ◆ 2.95 Denver Zone 1 Well Location
- ▣ Basin F IRA Structure

/ Containment System  
 / Physical Barrier  
 / Hydraulic Barrier

Analyte Concentration in  $\mu\text{g/l}$

Note: Open symbol  
 indicates analyte  
 was not detected

0 5000 10,000 Feet  
 0 1000 2000 3000 Meters

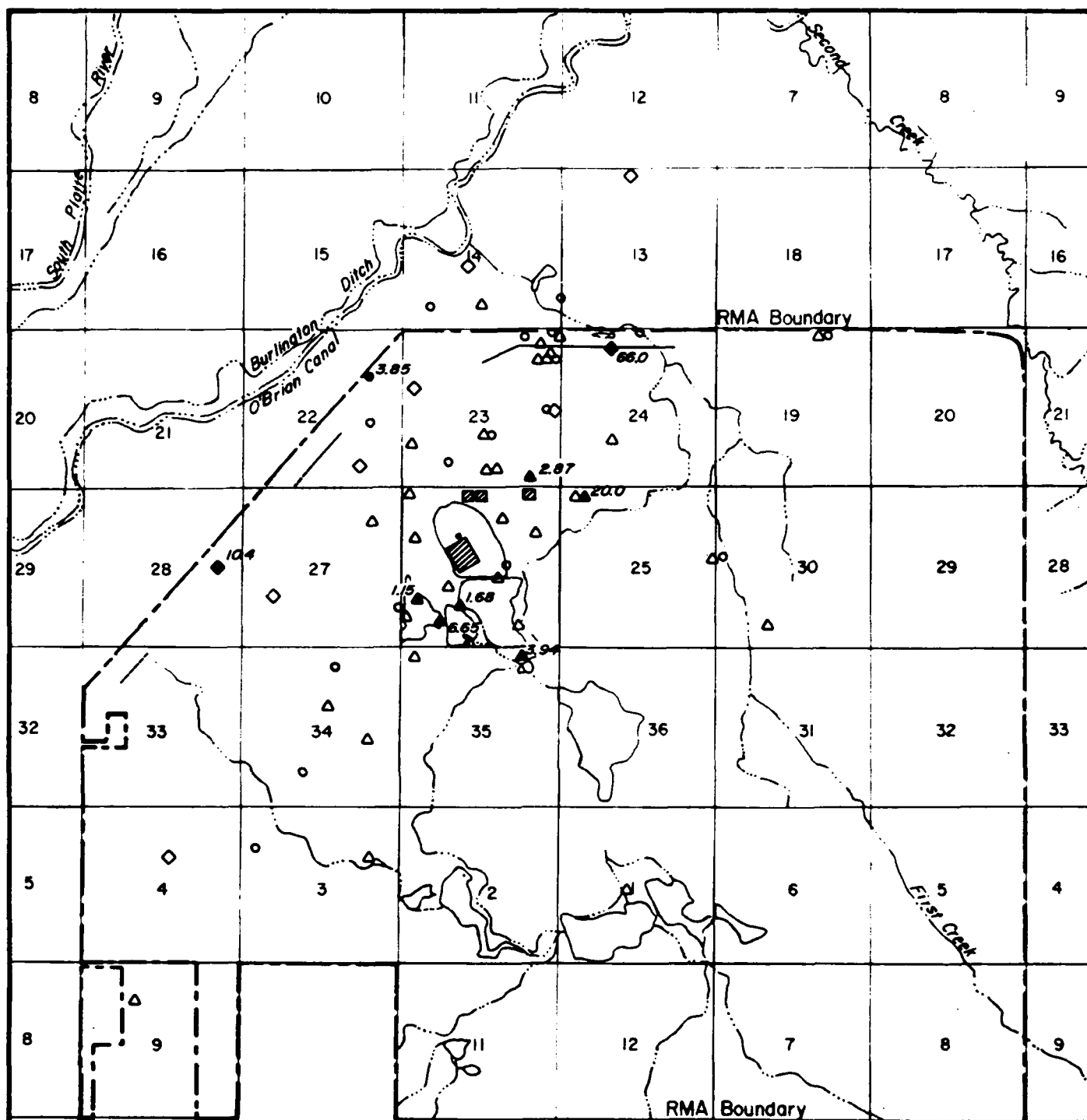
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 Commerce City, Colorado

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Figure A-13  
 Summed Volatile Aromatic  
 Compound Detections  
 Denver Zones 1U & 1  
 Fall 1988  
 CMP GVAR FY89



### Explanation

- ▲<sup>200</sup> Denver Zone 2 Well Location
- <sup>3.85</sup> Denver Zone 3 Well Location
- ▶<sup>66.0</sup> Denver Zone 5 Well Location

■ Basin F IRA Structure

- Containment System
- Physical Barrier
- - - Hydraulic Barrier

Analyte Concentration in  $\mu\text{g/l}$

Note: Open symbol  
Indicates analyte  
was not detected

0 5000 10,000 Feet  
0 1000 2000 3000 Meters

Prepared for:

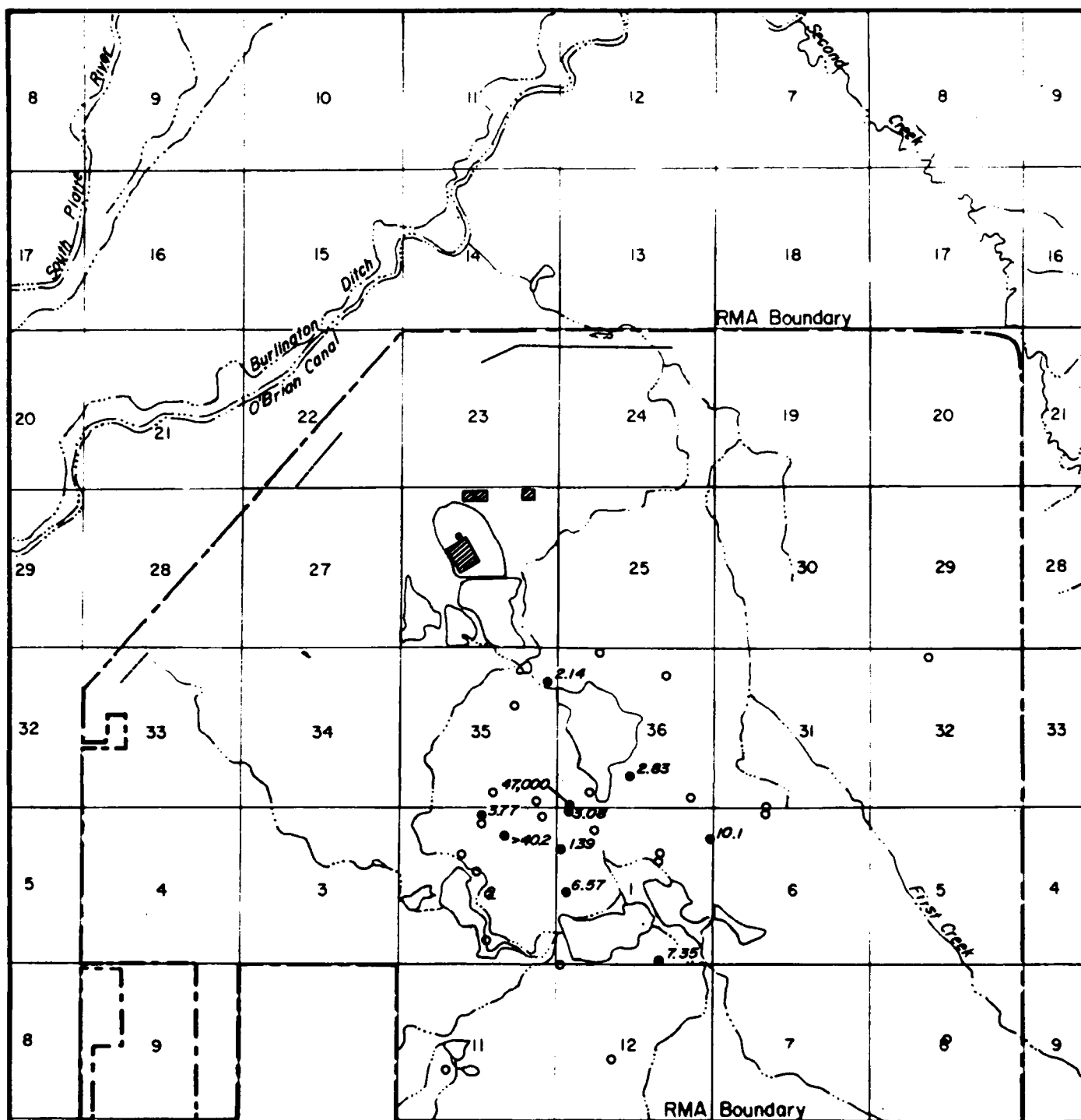
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Figure A-14

Summed Volatile Aromatic  
Compound Detections  
Denver Zones 2, 3, & 5  
Fall 1988  
CMP GWAR FY89



### Explanation

- <sup>2.63</sup> **Denver Zone A Well Location**
- **Containment System**
- **Physical Barrier**
- **Hydraulic System**
- ▣ **Basin F IRA Structure**

**Analyte Concentration in µg/l.**

**Note : Open symbol  
indicates analyte  
was not detected**



A horizontal number line with two scales. The top scale is labeled 'Feet' and has markings at 0, 5000, and 10,000. The bottom scale is labeled 'Meters' and has markings at 0, 1000, 2000, and 3000. The line shows that 10,000 feet is equivalent to 3000 meters.

**Prepared for :**

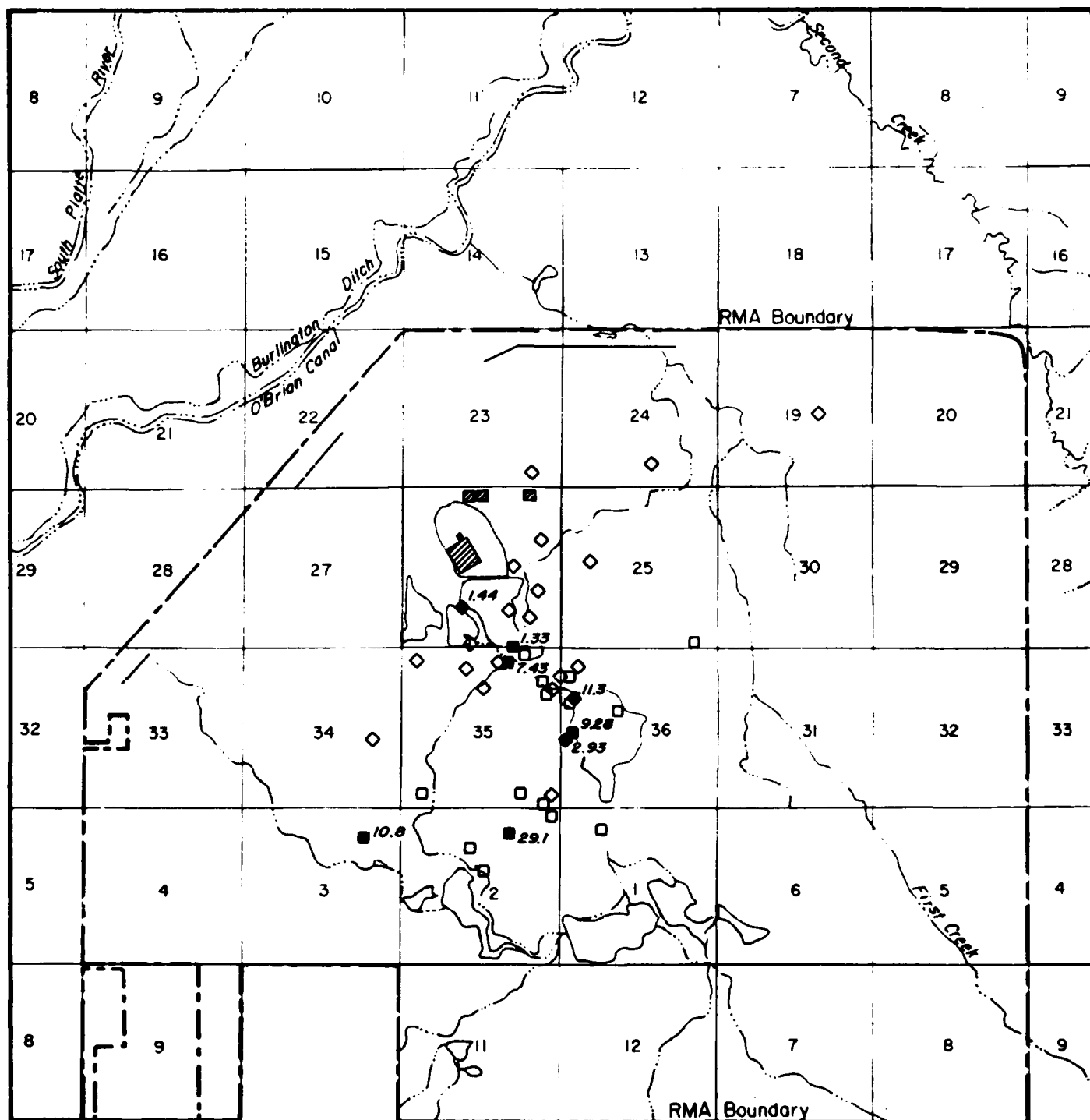
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Rocky Mountain Arsenal  
Commerce City, Colorado

**Prepared by :**

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**Harding Lawson Associates**

**Figure A-16**

**Benzene Detections  
Denver Zone A  
Fall 1988  
CMP GWAR FY89**



### Explanation

- 1.33 Denver Zone 1U Well Location
- ◆ 1.33 Denver Zone 1 Well Location
- ▨ Basin F IRA Structure
- Containment System
- Physical Barrier
- Hydraulic Barrier

Analyte Concentration in mg/l

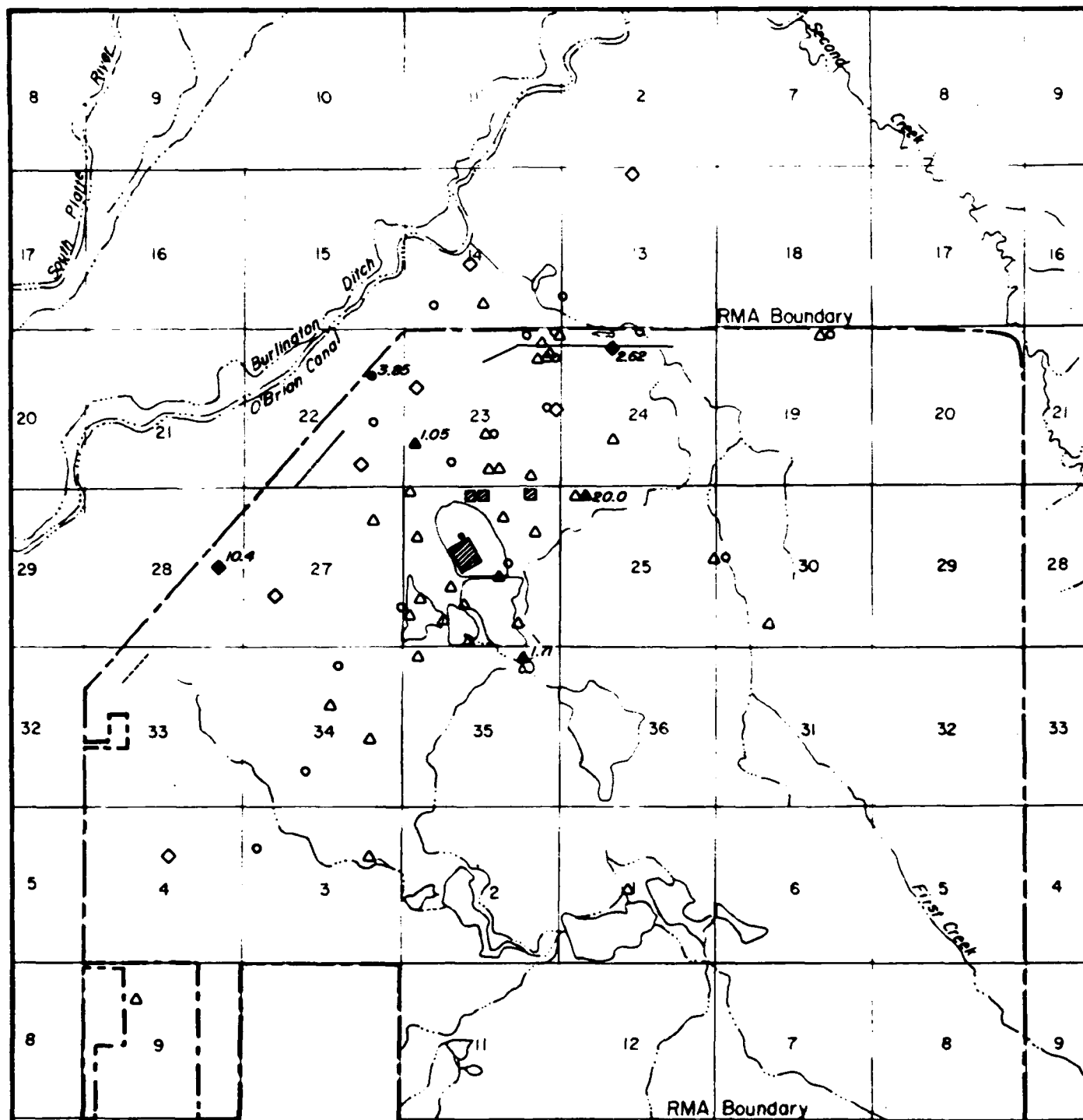
Note: Open symbol  
Indicates analyte  
was not detected

0 5000 10,000 Feet  
0 1000 2000 3000 Meters

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Commerce City, Colorado  
Prepared by:  
R.L. Stoller & Associates, Inc.  
Harding Lawson Associates

Figure A-16

**Benzene Detections  
Denver Zones 1U & 1  
Fall 1988  
CMP GVAR FY89**



### Explanation

- ▲<sup>20.0</sup> Denver Zone 2 Well Location
- <sup>3.85</sup> Denver Zone 3 Well Location
- ◆<sup>10.4</sup> Denver Zone 5 Well Location

- Containment System
- Physical Barrier
- Hydraulic Barrier

Analyte Concentration in µg/l

Note: Open symbol indicates analyte was not detected

Basin F IRA Structure

N

0 5000 10,000 Feet  
0 1000 2000 3000 Meters

Prepared for:

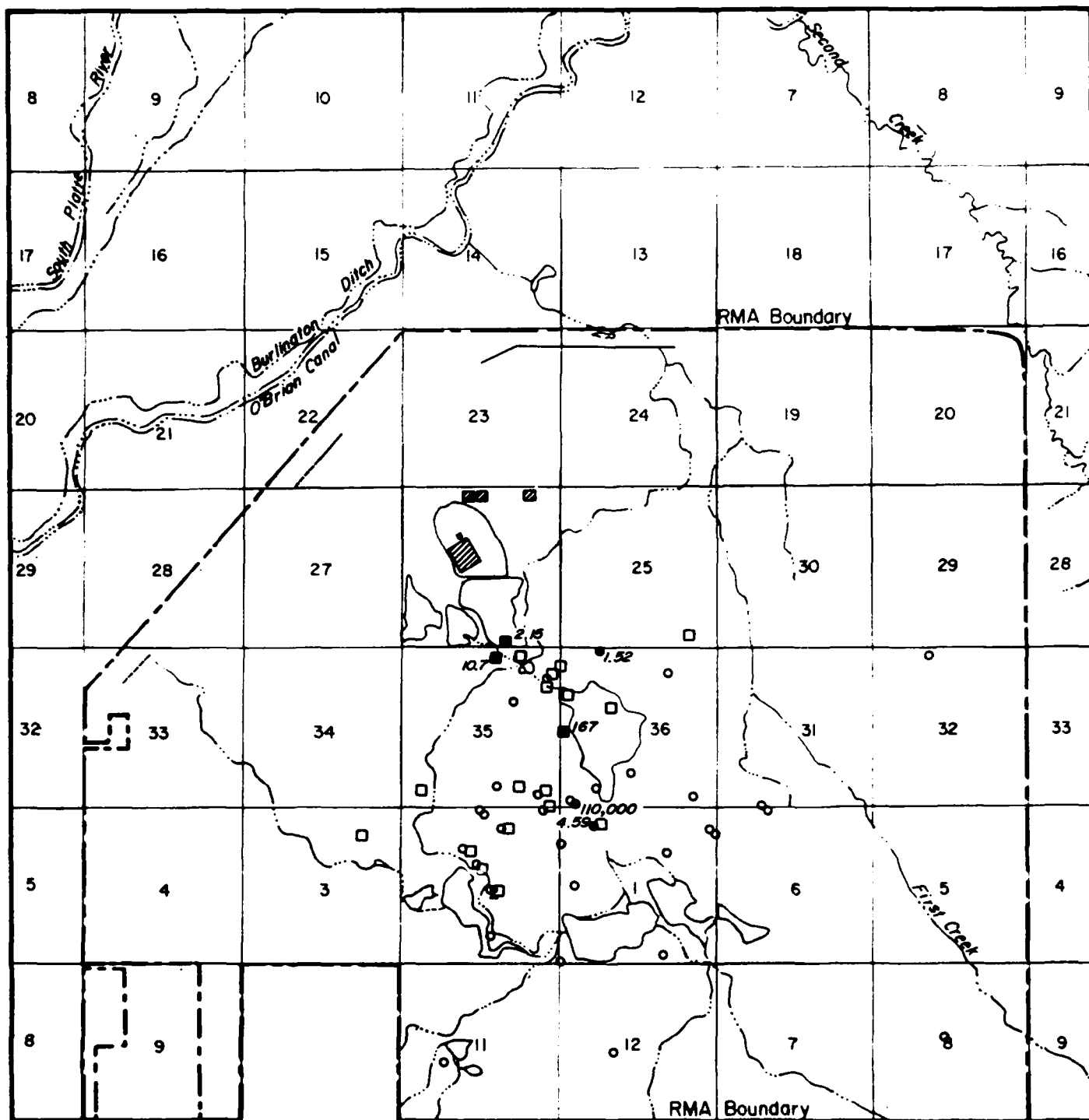
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Figure A-17

**Benzene Detections**  
**Denver Zones 2, 3, & 5**  
**Fall 1988**  
**CMP GWAR FY89**



### Explanation

- 1.52 Denver Zone A Well Location
- 1.67 Denver Zone 1U Well Location
- ▣ Basin F IRA Structure
- Containment System
  - Physical Barrier
  - Hydraulic Barrier

Analyte Concentration in µg/l

Note: Open symbol  
indicates analyte  
was not detected

0 5000 10,000 Feet  
0 1000 2000 3000 Meters

Prepared for:

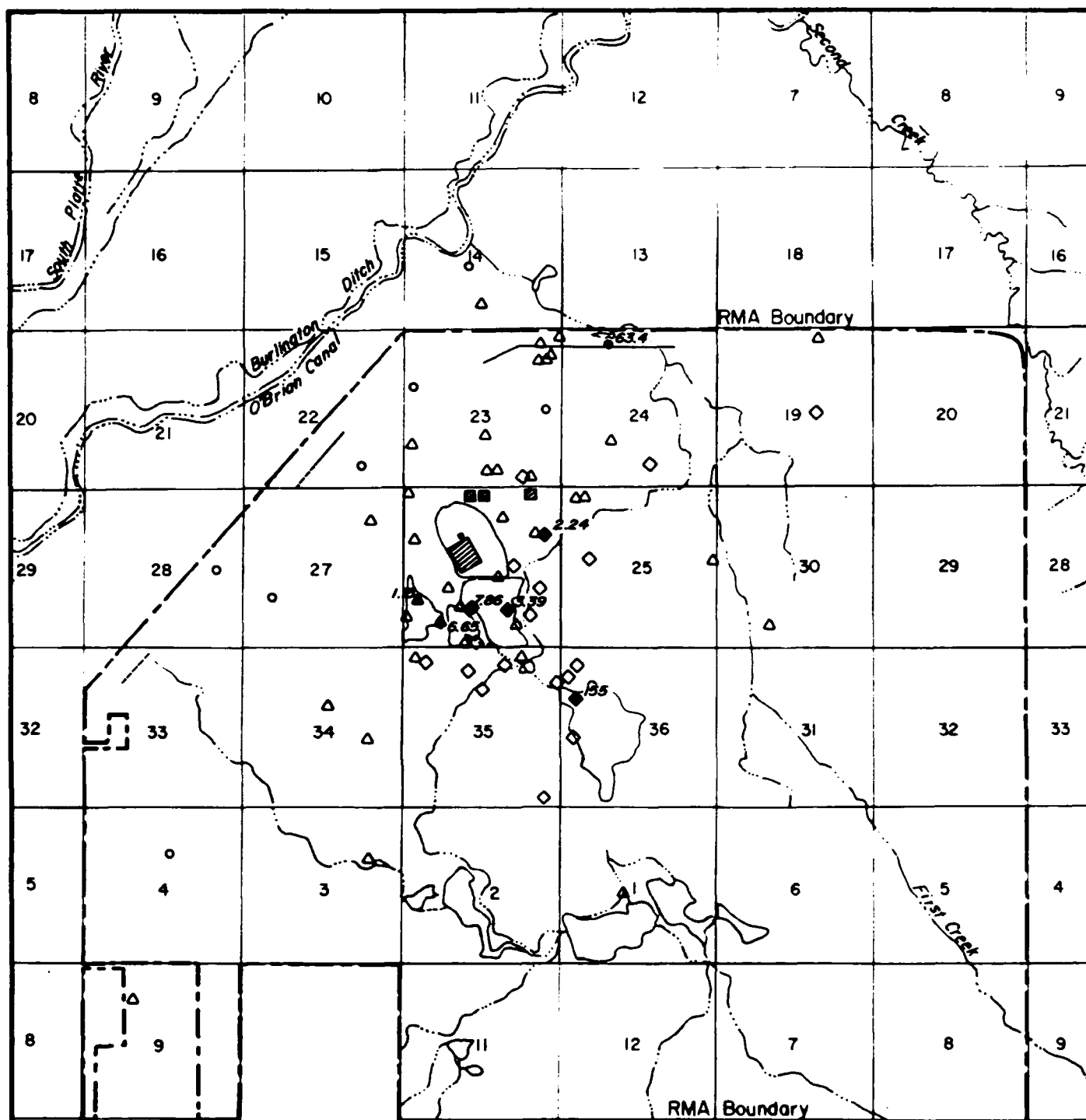
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Commerce City, Colorado

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Harding Lawson Associates

Figure A-18

Chlorobenzene Detections  
Denver Zones A & 1U  
Fall 1988  
CMP GWAR FY89



### Explanation

- ◆ 2.24 Denver Zone 1 Well Location
- ▲ 1.15 Denver Zone 2 Well Location
- 63.4 Denver Zone 5 Well Location

- Containment System
- Physical Barrier
- Hydraulic Barrier

Analyte Concentration in  $\mu\text{g/l}$

Note: Open symbol  
Indicates analyte  
was not detected

▣ Basin F IRA  
Structure

N

0 5000 10,000 Feet  
0 1000 2000 3000 Meters

Prepared for:

U.S. Army Program Manager for  
Rocky Mountain Arsenal  
Commerce City, Colorado

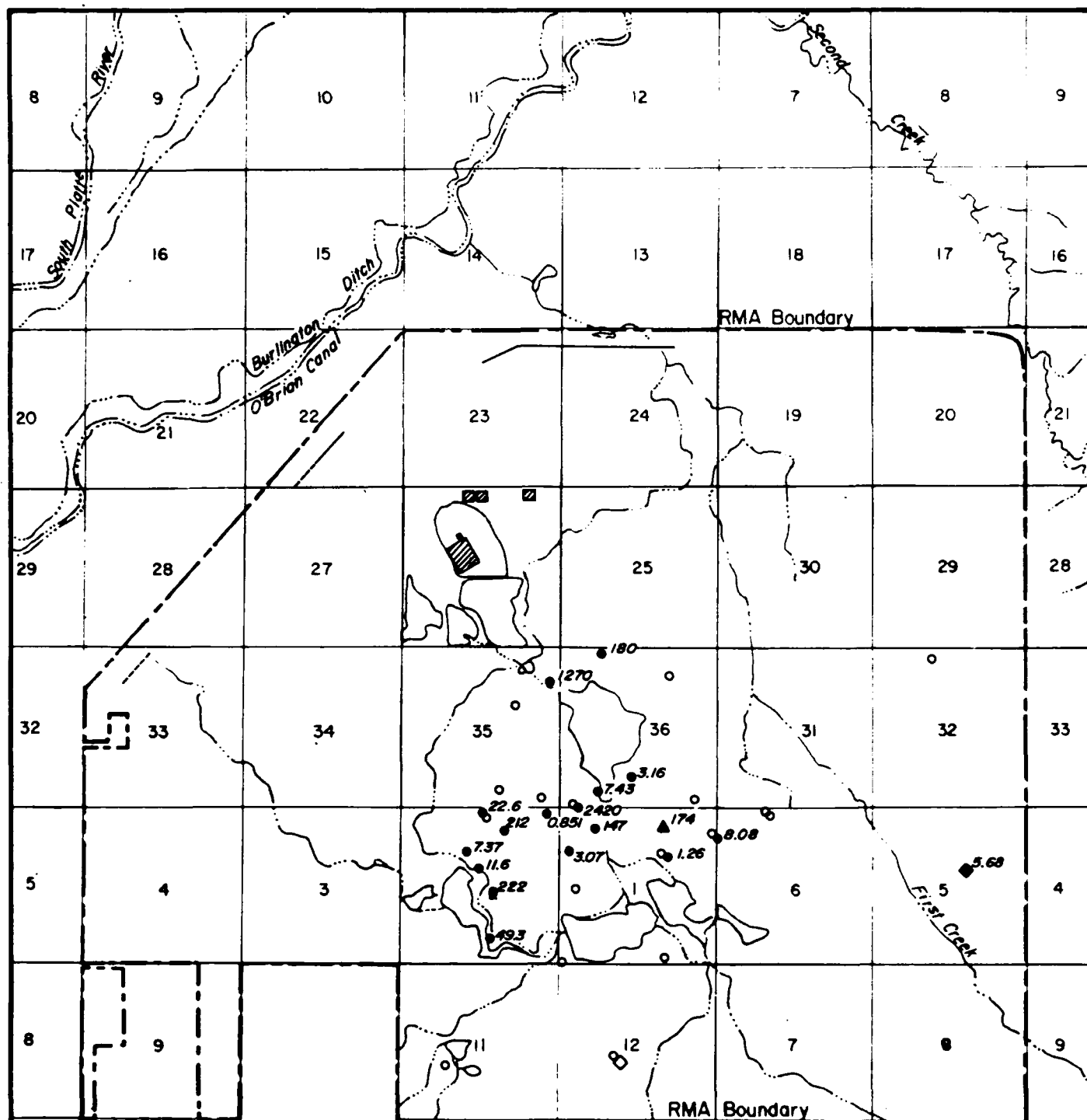
Prepared by:

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Figure A-19

Chlorobenzene Detections  
Denver Zones 1, 2, & 5  
Fall 1988  
CMP GVAR FY89





### Explanation

- ◆ 5.68 Denver Zone B Well Location
- 180 Denver Zone A Well Location
- ▲ 174 Denver Zone VC Well Location
- ▣ Basin F IRA Structure
- Containment System
  - Physical Barrier
  - Hydraulic Barrier

Analyte Concentration in µg/l

Note: Open symbol  
Indicates analyte  
was not detected

0 5000 10,000 Feet  
0 1000 2000 3000 Meters

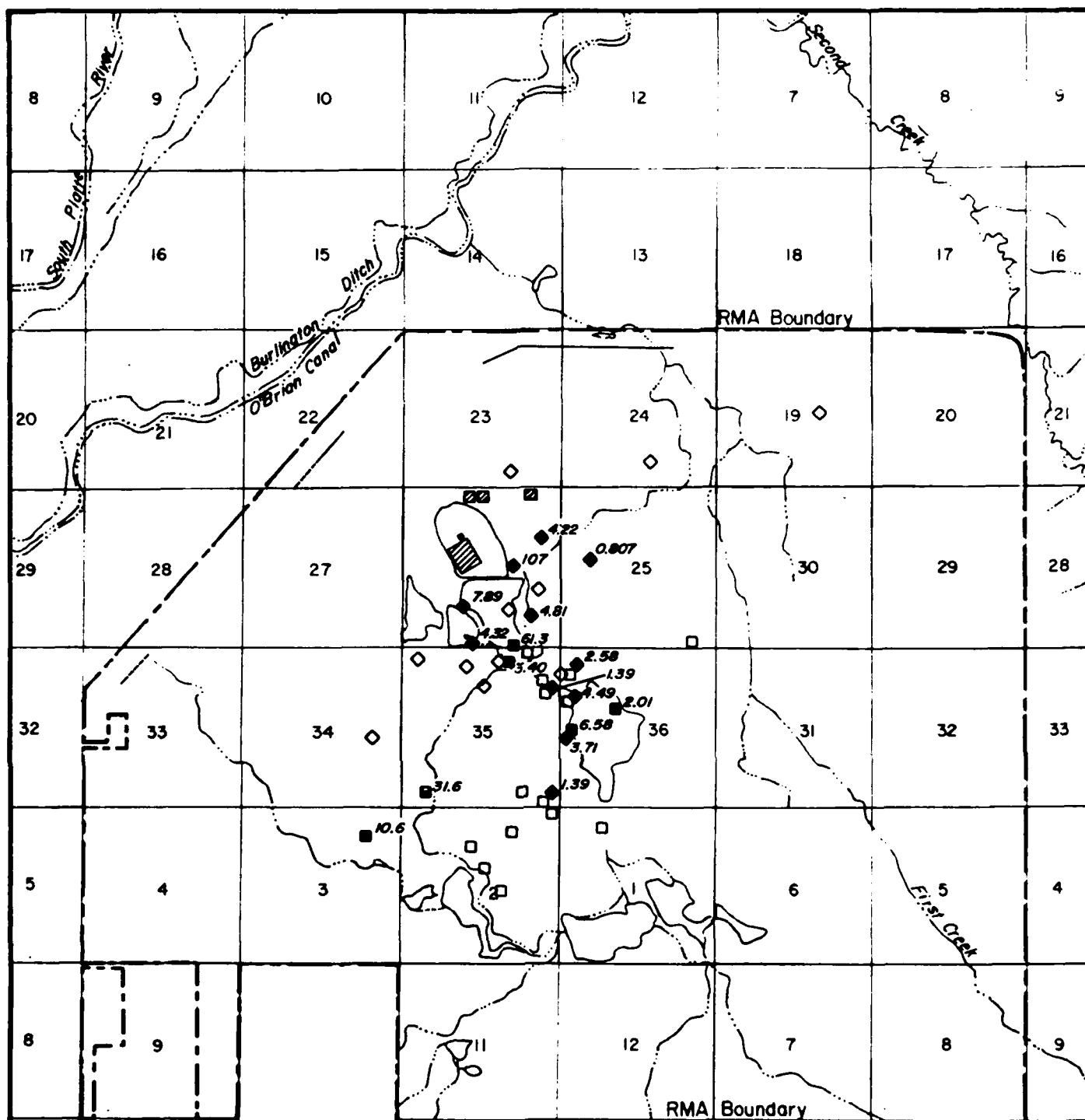
Prepared for:

U.S. Army Program Manager for  
Rocky Mountain Arsenal  
Commerce City, Colorado

Prepared by:

R.L. Stoller & Associates, Inc.  
Harding Lawson Associates

Figure A-20  
Summed Organohalogen  
Compound Detections  
Denver Zones B, VC, & A  
Fall 1988  
CMP GVAR FY89



### Explanation

- 61.3 Denver Zone 1U Well Location
- ◆ 2.58 Denver Zone 1 Well Location
- ▣ Basin F IRA Structure
- Containment System
- Physical Barrier
- Hydraulic Barrier

Analyte Concentration in  $\mu\text{g/l}$

Note: Open symbol  
Indicates analyte  
was not detected

0 5000 10,000 Feet  
0 1000 2000 3000 Meters

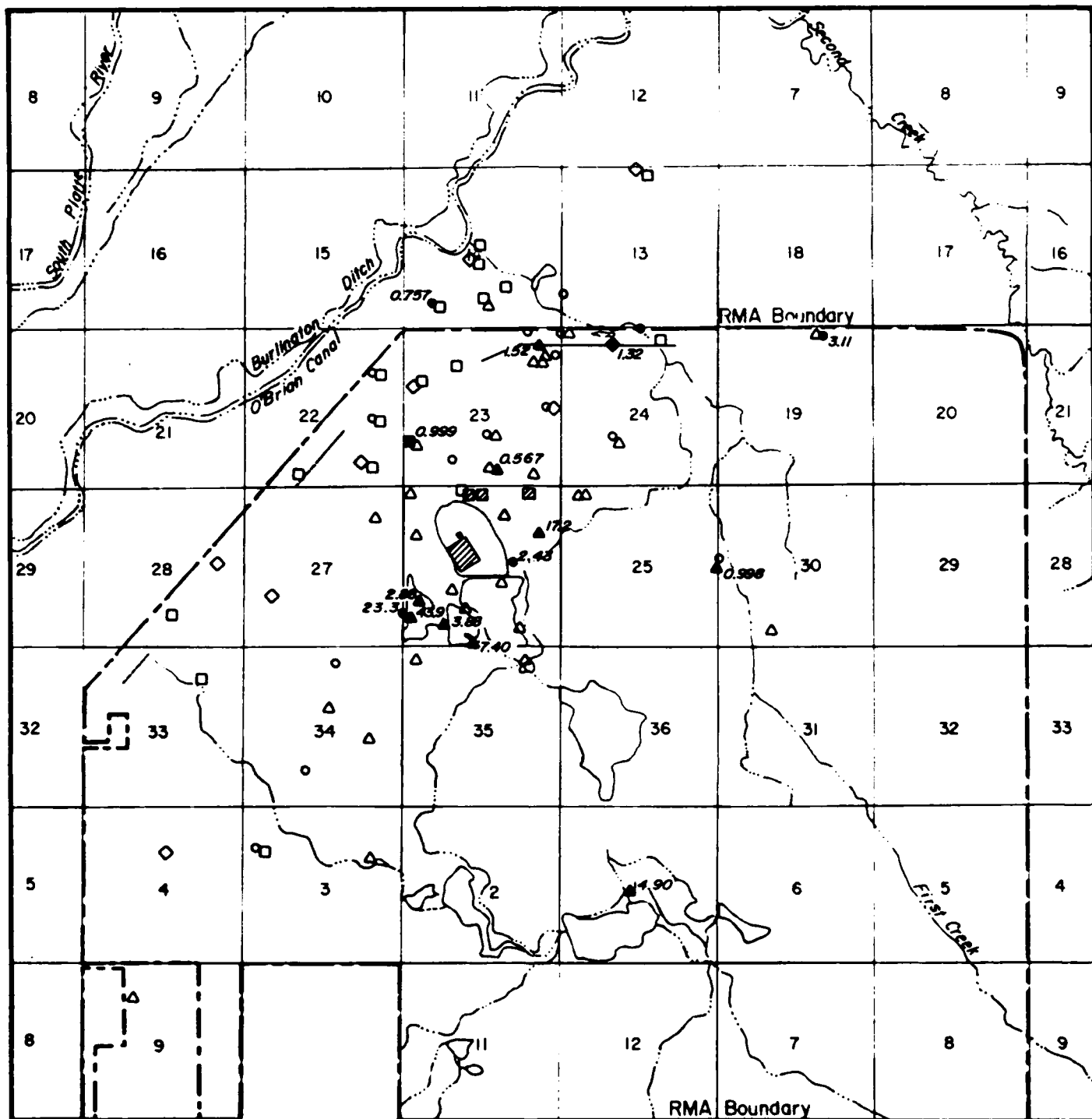
Prepared for:

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Rocky Mountain Arsenal  
Commerce City, Colorado

Prepared by:

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Harding Lawson Associates

Figure A-21  
Summed Organohalogen  
Compound Detections  
Denver Zones 1U & 1  
Fall 1988  
CMP QWAR FY89



### Explanation

- ▲ 0.567 Denver Zone 2 Well Location
- 2.43 Denver Zone 3 Well Location
- 0.989 Denver Zone 4 Well Location
- ◆ 1.32 Denver Zone 5 Well Location
- ▨ Basin F IRA Structure
- Containment System
- - - Physical Barrier
- ... Hydraulic Barrier

Analyte Concentration in  $\mu\text{g/l}$

Note : Open symbol  
Indicates analyte  
was not detected

Prepared for :

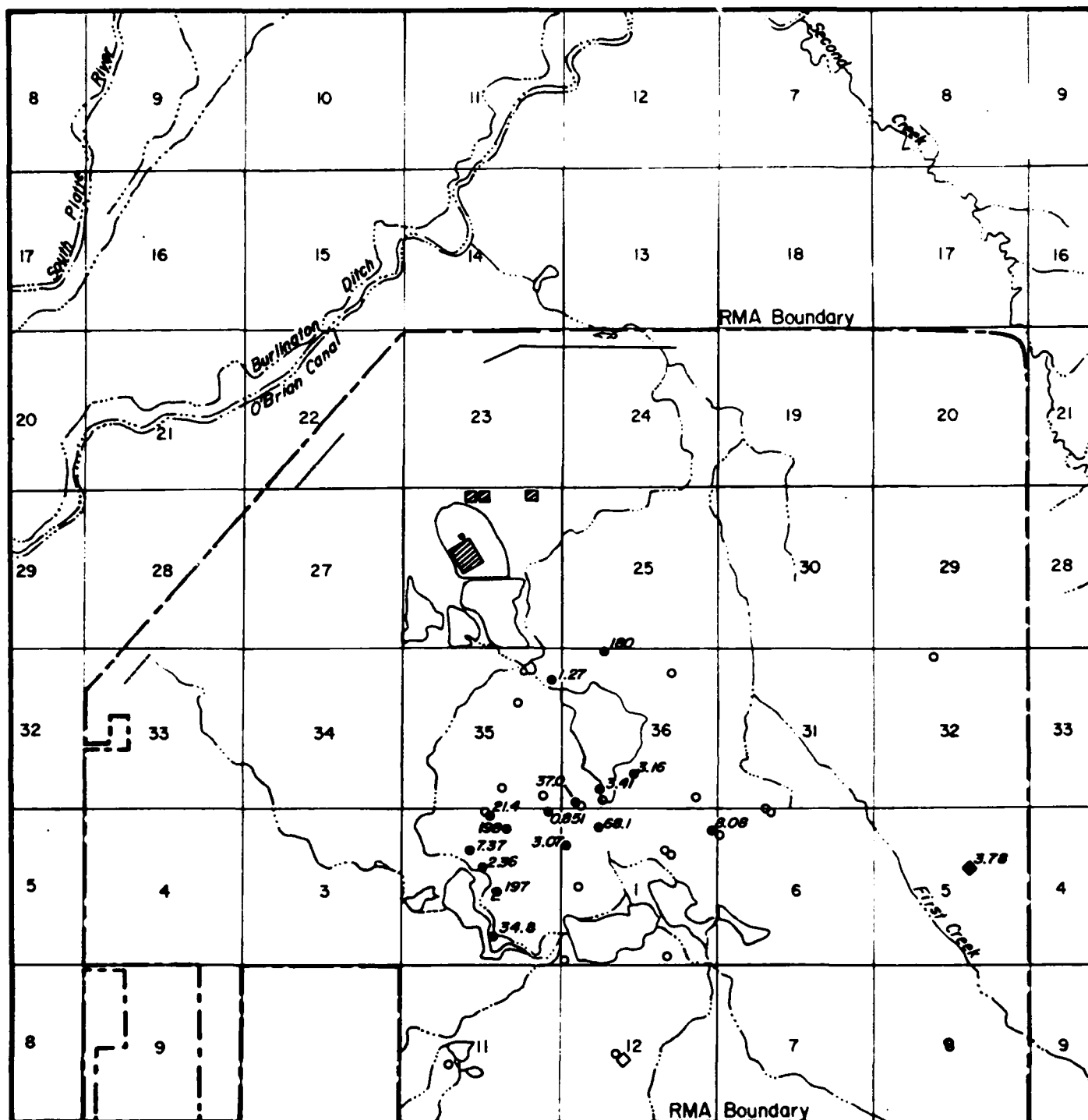
U.S. Army Program Manager for  
Rocky Mountain Arsenal  
Commerce City, Colorado

Prepared by :

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Figure A-22

Summed Organohalogen  
Compound Detections  
Denver Zones 2, 3, 4, & 5  
Fall 1988  
CMP GVAR FY89



### Explanation

◆ 3.78 Denver Zone B Well Location

● 180 Denver Zone A Well Location

— Containment System

— Physical Barrier

— Hydraulic Barrier

□ Basin F IRA Structure

Analyte Concentration in  $\mu\text{g/l}$

Note : Open symbol  
indicates analyte  
was not detected

0 5000 10,000 Feet  
0 1000 2000 3000 Meters

Prepared for :

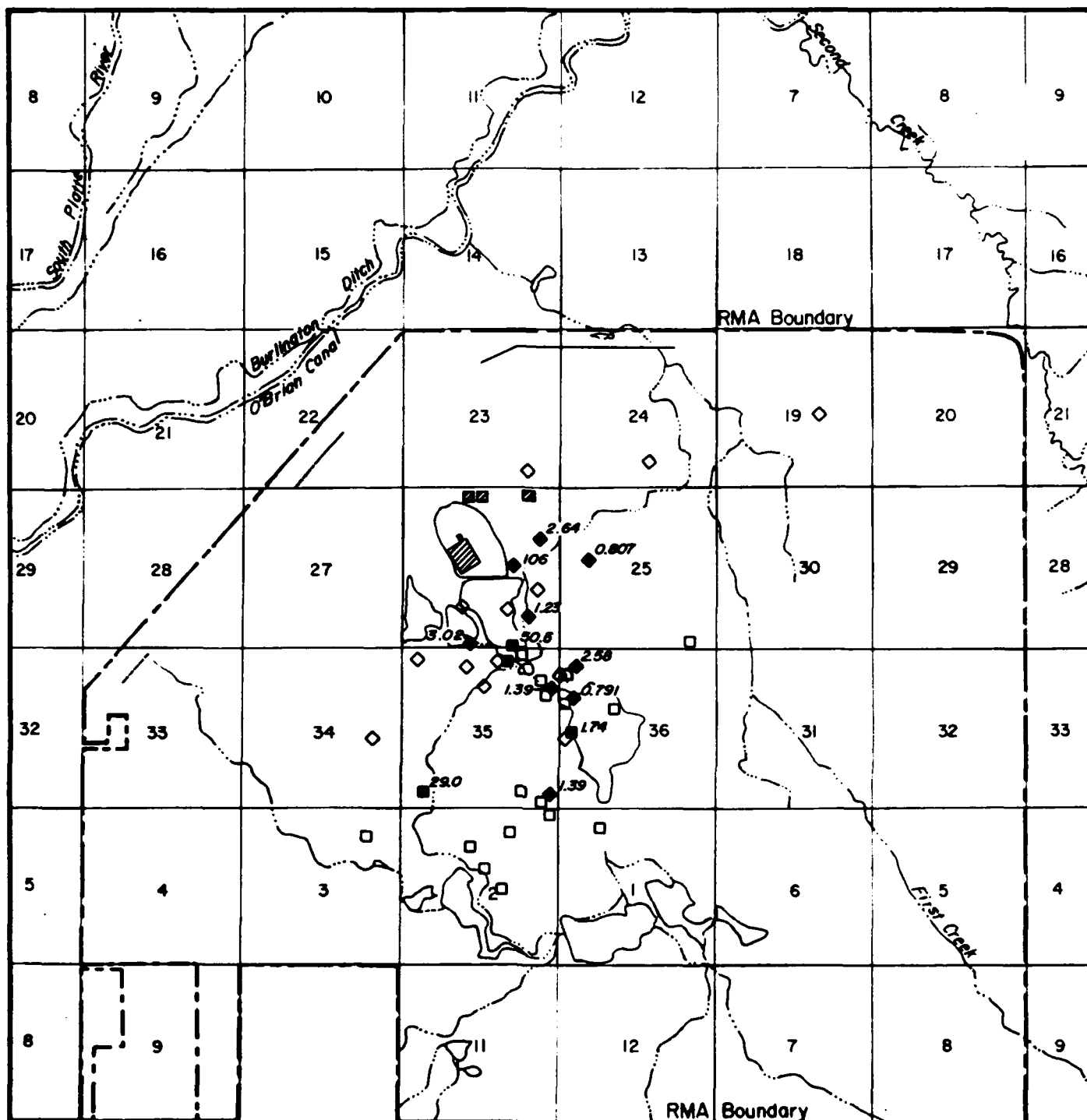
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Figure A-23

Chloroform Detections  
Denver Zones B & A  
Fall 1988  
CMP GVAR FY89



### Explanation

- 52.0 Denver Zone 1U Well Location
- ◆ 2.58 Denver Zone 1 Well Location
- ▨ Basin F IRA Structure
- Containment System
  - Physical Barrier
  - - - Hydraulic Barrier

Analyte Concentration in µg/l

Note: Open symbol  
Indicates analyte  
was not detected

0 5000 10,000 Feet  
0 1000 2000 3000 Meters

Prepared for:

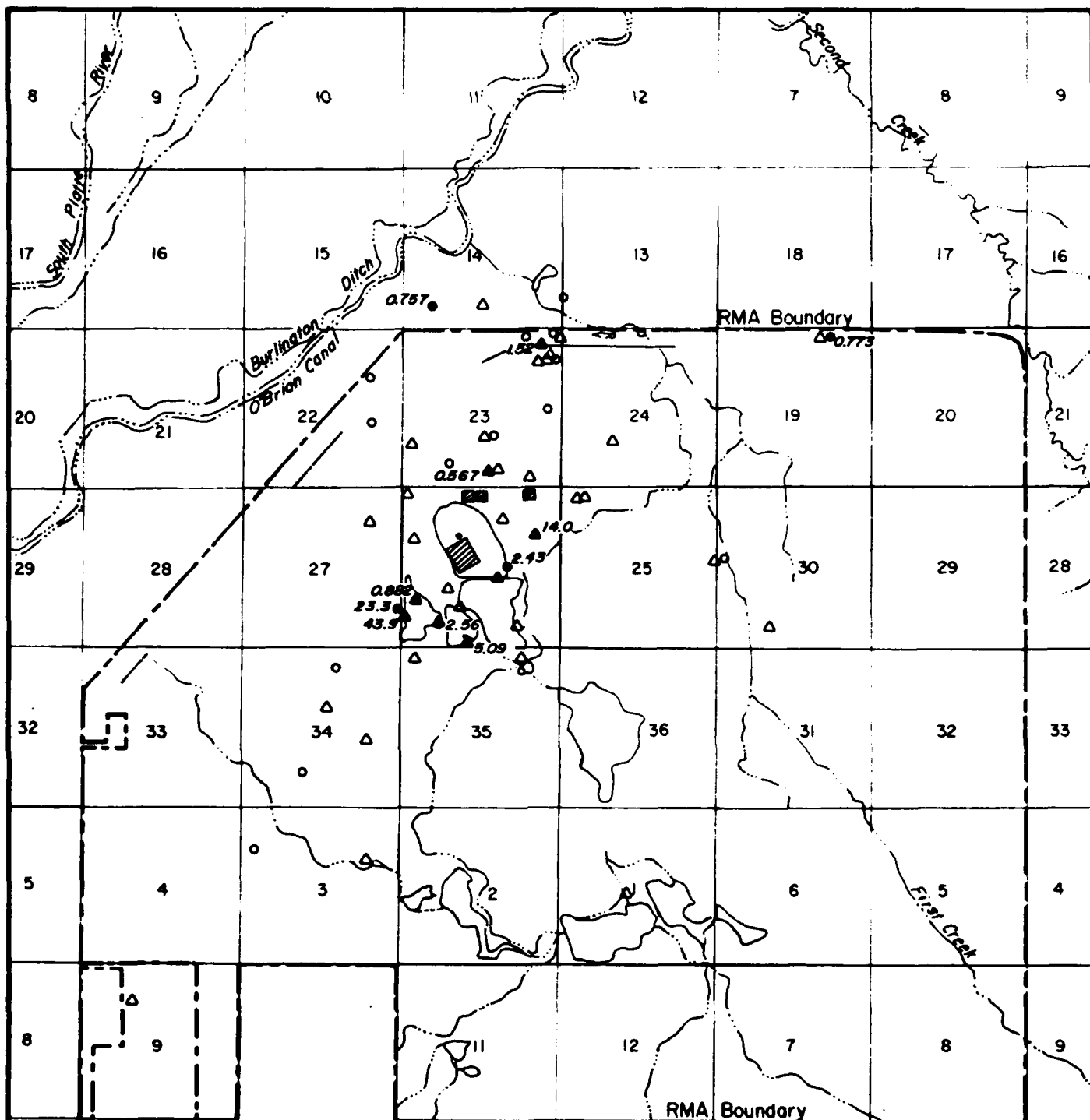
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Commerce City, Colorado

Prepared by:

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Figure A-24

**Chloroform Detections  
Denver Zones 1U & 1  
Fall 1988  
CMP GWAR FY89**



### Explanation

▲ 152 Denver Zone 2 Well Location

● 233 Denver Zone 3 Well Location

— Containment System

— Physical Barrier

— Hydraulic Barrier

▣ Basin F IRA Structure

Analyte Concentration in  $\mu\text{g/l}$

Note: Open symbol  
Indicates analyte  
was not detected

0 5000 10,000 Feet  
0 1000 2000 3000 Meters

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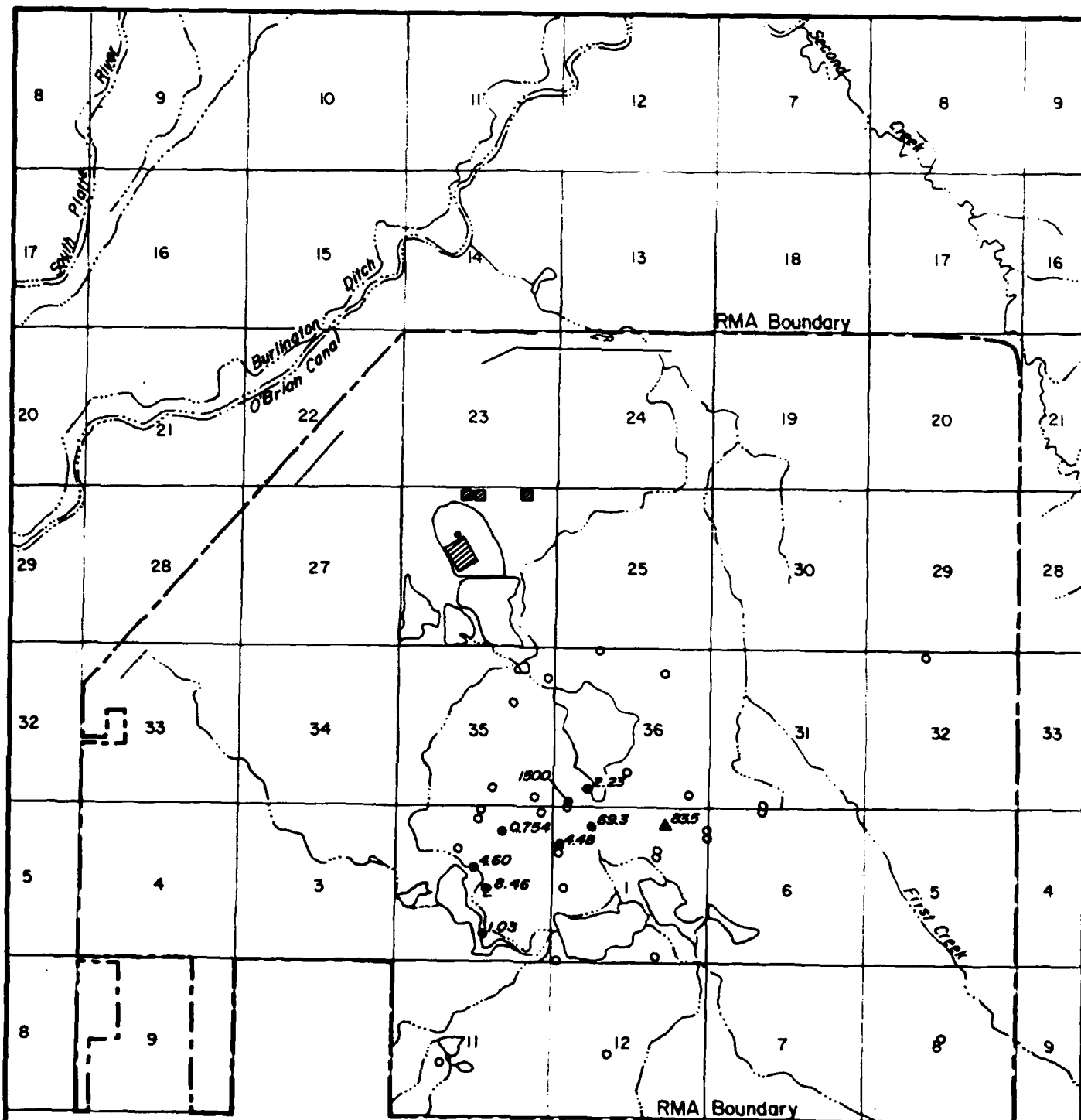
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Harding Lawson Associates

Figure A-25

Chloroform Detections  
Denver Zones 2 & 3

Fall 1988

CMP GWAR FY89



### Explanation

● 223 Denver Zone A Well Location

▲ 63.5 Denver Zone VC Well Location

— Containment System  
 — Physical Barrier  
 — Hydraulic Barrier

■ Bash F IIA Structure

Analyte Concentration in  $\mu\text{g/l}$

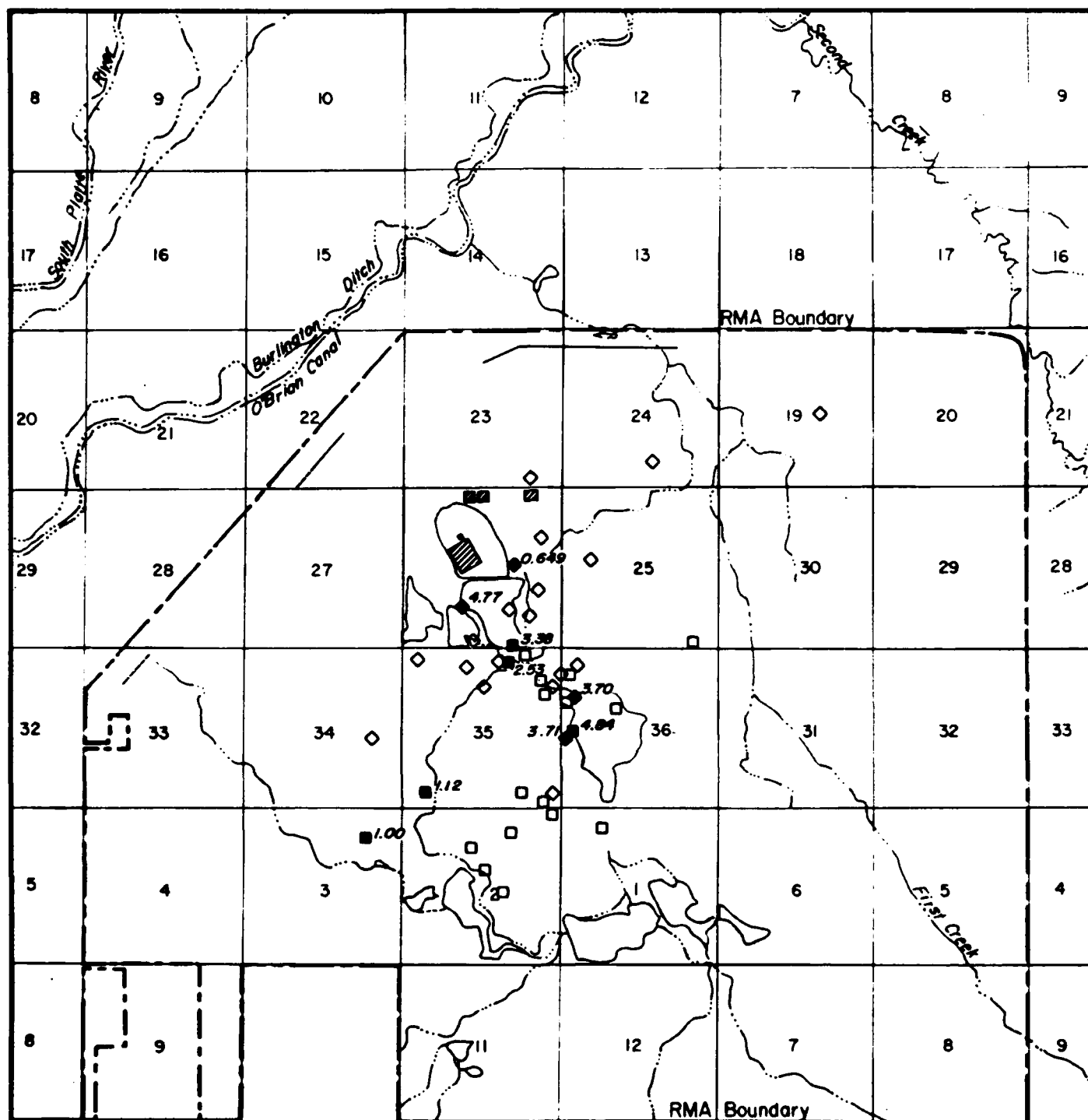
Note: Open symbol  
 Indicates analyte  
 was not detected

0 5000 10,000 Feet  
 0 1000 2000 3000 Meters

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Figure A-26  
 Trichloroethene (TRCLEE)  
 Detections  
 Denver Zones VC & A  
 Fall 1988  
 CMP GWAR FY89



### Explanation

- 3.38 Denver Zone 1U Well Location
- ◆ 3.70 Denver Zone 1 Well Location
- ▣ Basin F IRA Structure

- Containment System
- Physical Barrier
- Hydraulic Barrier

Analyte Concentration in µg/l

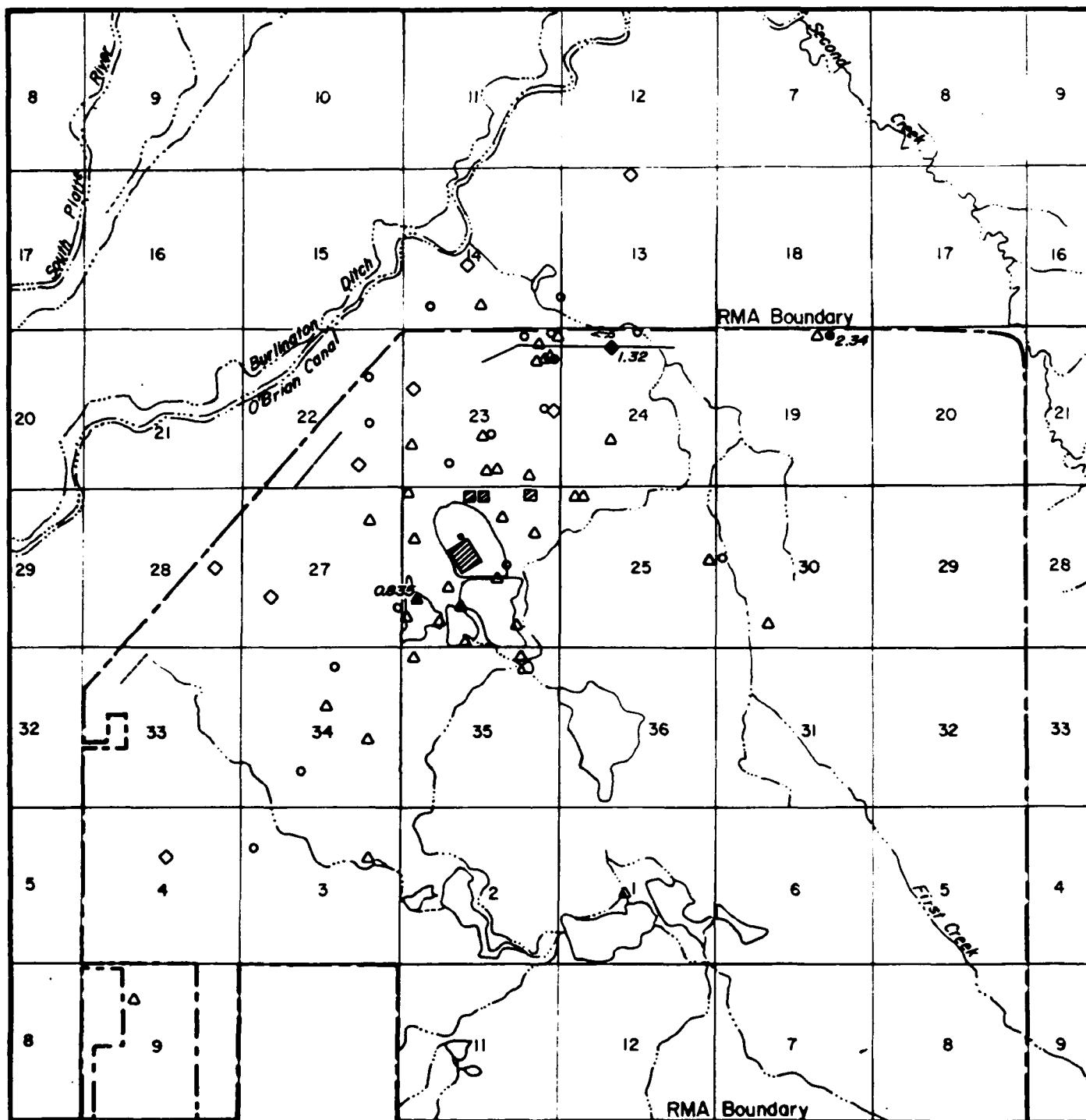
Note: Open symbol  
Indicates analyte  
was not detected

0 5000 10,000 Feet  
0 1000 2000 3000 Meters

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Figure A-27  
Trichloroethene (TRCLEE)  
Detections  
Denver Zones 1U & 1  
Fall 1988  
CMP QWAR FY89





### Explanation

- ▲ 0.835 Denver Zone 2 Well Location
- 2.34 Denver Zone 3 Well Location
- ◆ 1.32 Denver Zone 5 Well Location

▨ Basin F IRA Structure

- Containment System
- Physical Barrier
- Hydraulic Barrier

Analyte Concentration in µg/l

Note: Open symbol  
Indicates analyte  
was not detected



0 5000 10,000 Feet  
0 1000 2000 3000 Meters

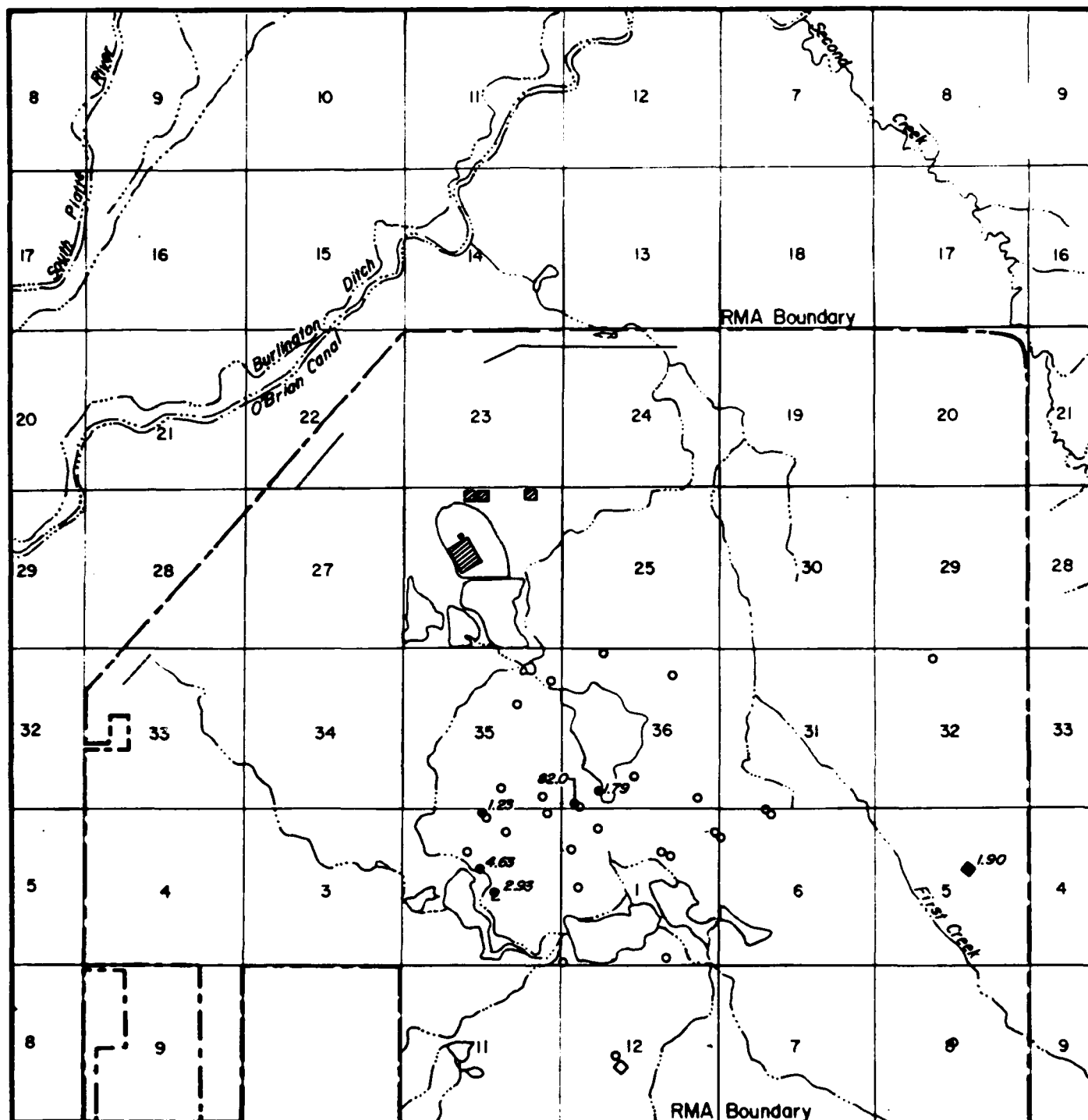
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Commerce City, Colorado

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Harding Lawson Associates

Figure A-28  
Trichloroethene (TRCLEE)  
Detections  
Denver Zones 2, 3, & 5  
Fall 1988  
CMP GWAR FY89



### Explanation

● 1.79 Denver Zone A Well Location

◆ 1.90 Denver Zone B Well Location

— Containment System

— Physical Barrier

— Hydraulic Barrier

■ Basin F IRA Structure

Analyte Concentration in  $\mu\text{g/l}$

Note: Open symbol  
Indicates analyte  
was not detected

0 5000 10,000 Feet  
0 1000 2000 3000 Meters

Prepared for:

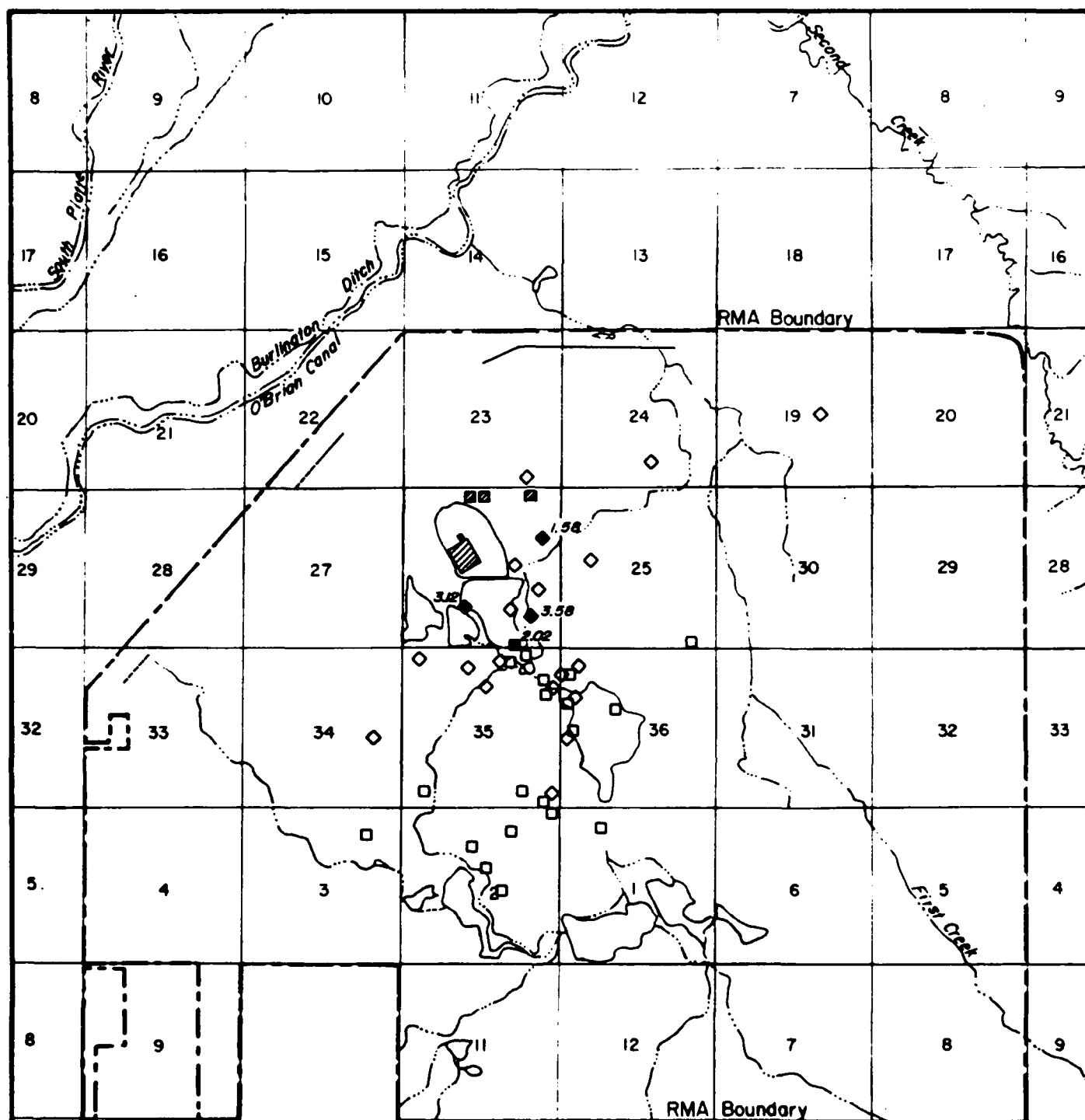
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Commerce City, Colorado

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Figure A-29

Tetrachloroethene (TCLE)  
Detections  
Denver Zones A & B  
Fall 1988  
CMP GVAR FY89



### Explanation

- 2.02 Denver Zone 1U Well Location
- ◆ 3.58 Denver Zone 1 Well Location
- ▣ Basin F IRA Structure

- Containment System
- Physical Barrier
- Hydraulic Barrier

Analyte Concentration in  $\mu\text{g/l}$

Note: Open symbol  
Indicates analyte  
was not detected

0 5000 10,000 Feet  
0 1000 2000 3000 Meters

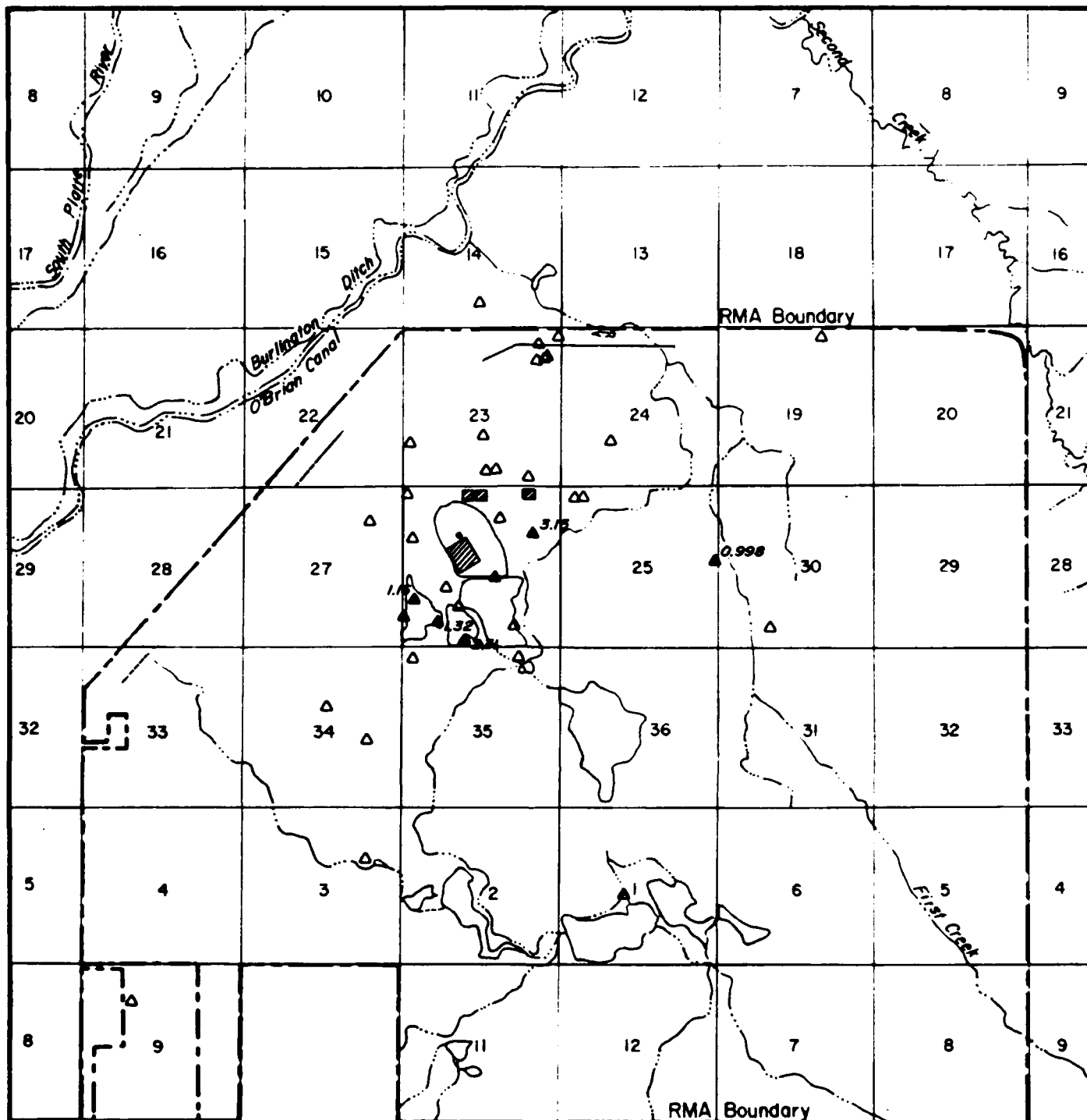
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Commerce City, Colorado

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Harding Lawson Associates

Figure A-30  
Tetrachloroethene (TCLE)  
Detections  
Denver Zones 1U & 1  
Fall 1988  
CMP GVAR FY89



### Explanation

▲<sup>3.15</sup> Denver Zone 2 Well Location

— Containment System

— Physical Barrier

— Hydraulic Barrier

▣ Basin F IRA Structure

Analyte Concentration in µg/l

Note : Open symbol  
Indicates analyte  
was not detected



0 5000 10,000 Feet  
0 1000 2000 3000 Meters

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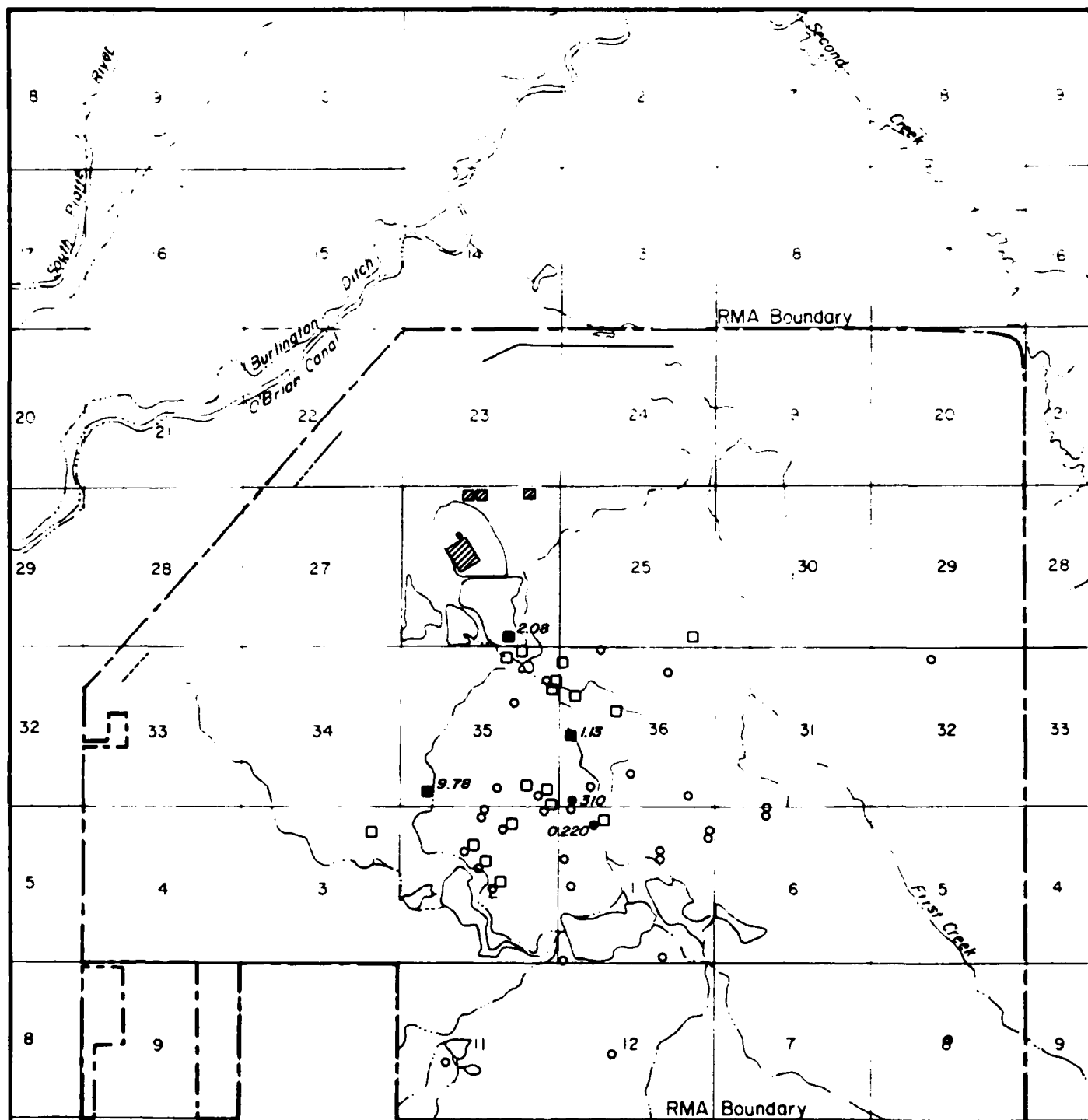
Figure A-31

Tetrachloroethene (TCLE)  
Detections

Denver Zone 2

Fall 1988

CMP GWAR FY89



### Explanation

- 310 Denver Zone A Well Location
- 2.08 Denver Zone 1U Well Location
- ▣ Basin F IRA Structure
- Containment System
- Physical Barrier
- Hydraulic Barrier

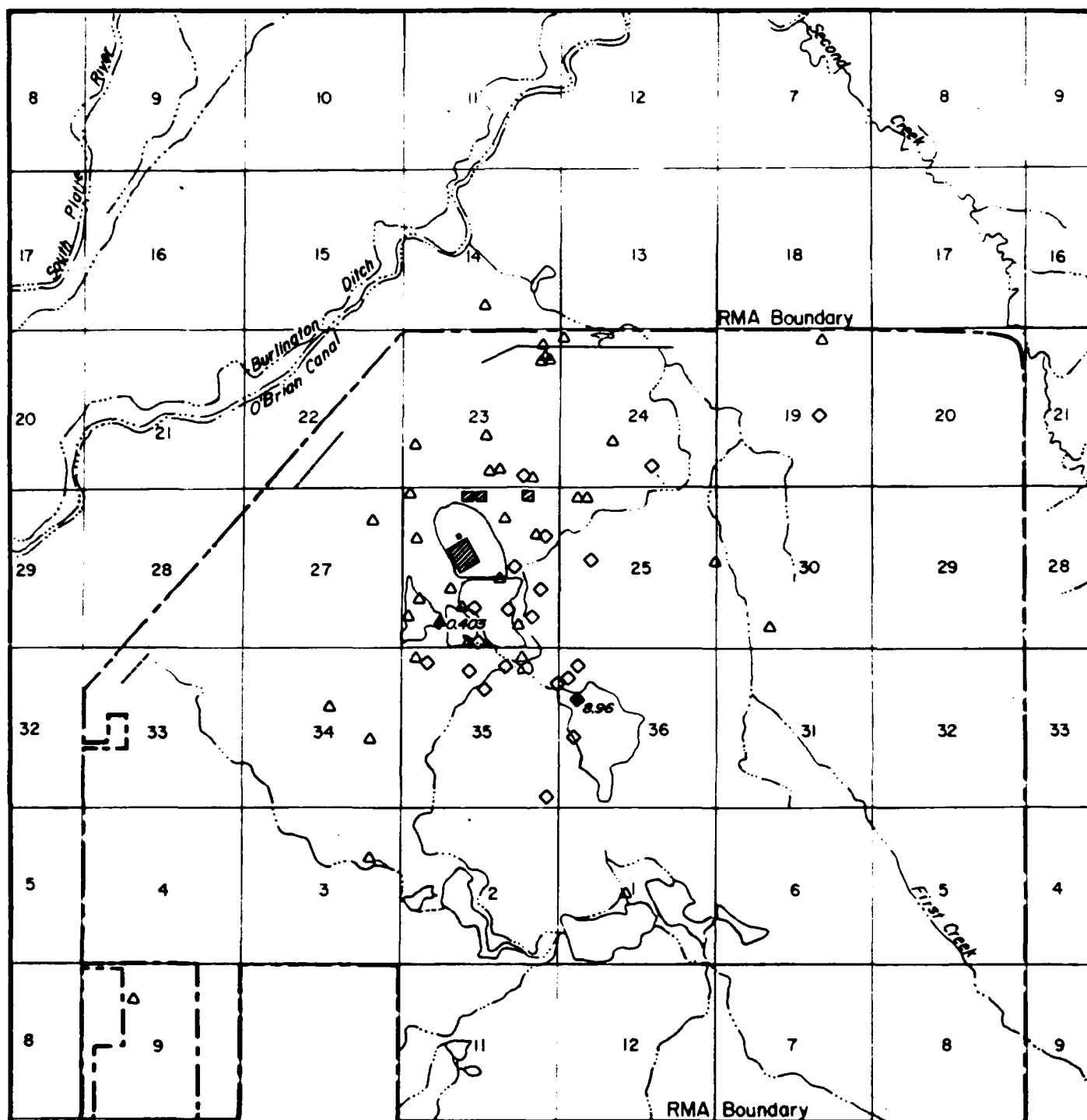
Analyte Concentration in µg/l

Note : Open symbol  
Indicates analyte  
was not detected

0 5000 10,000 Feet  
0 1000 2000 3000 Meters

Prepared for :  
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Rocky Mountain Arsenal  
Commerce City, Colorado  
Prepared by :  
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Harding Lawson Associates

Figure A-32  
Dibromochloropropane (DBCP)  
Detections  
Denver Zones A & 1U  
Fall 1988  
CMP GWAR FY89



### Explanation

◆ 0.96 Denver Zone 1 Well Location

▲ 0.403 Denver Zone 2 Well Location

— Containment System  
 — Physical Barrier  
 — Hydraulic Barrier

▣ Basin F IRA Structure

Analyte Concentration in  $\mu\text{g/l}$

Note : Open symbol  
 indicates analyte  
 was not detected

0 5000 10,000 Feet  
 0 1000 2000 3000 Meters

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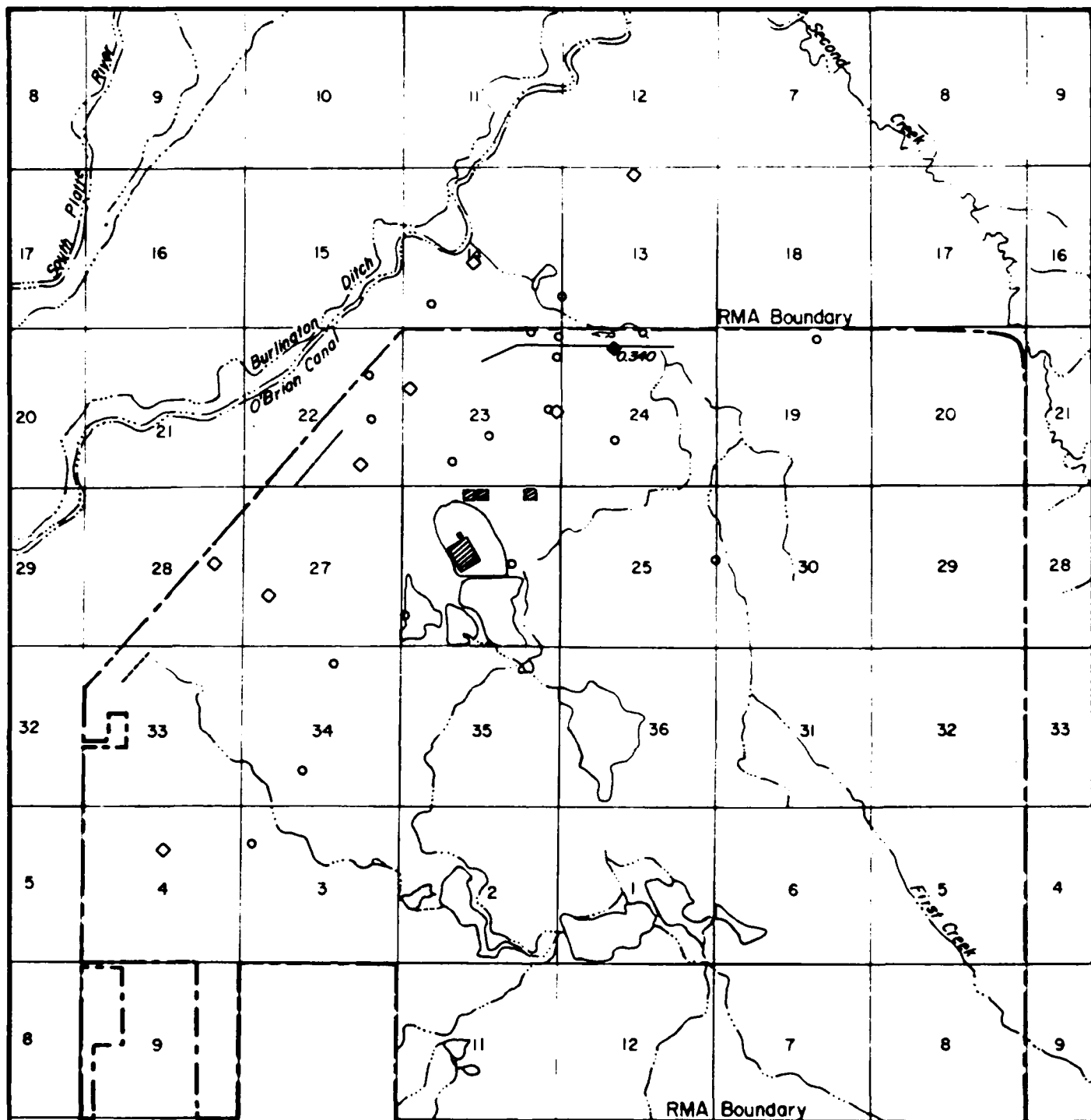
Figure A-33

Dibromochloropropane (DBCP)  
 Detections

Denver Zones 1 & 2

Fall 1988

CMP GVAR FY89



### Explanation

- Denver Zone 3 Well Location
- 0.340 Denver Zone 5 Well Location
- Containment System
- Physical Barrier
- Hydraulic Barrier
- ▨ Basin F IRA Structure

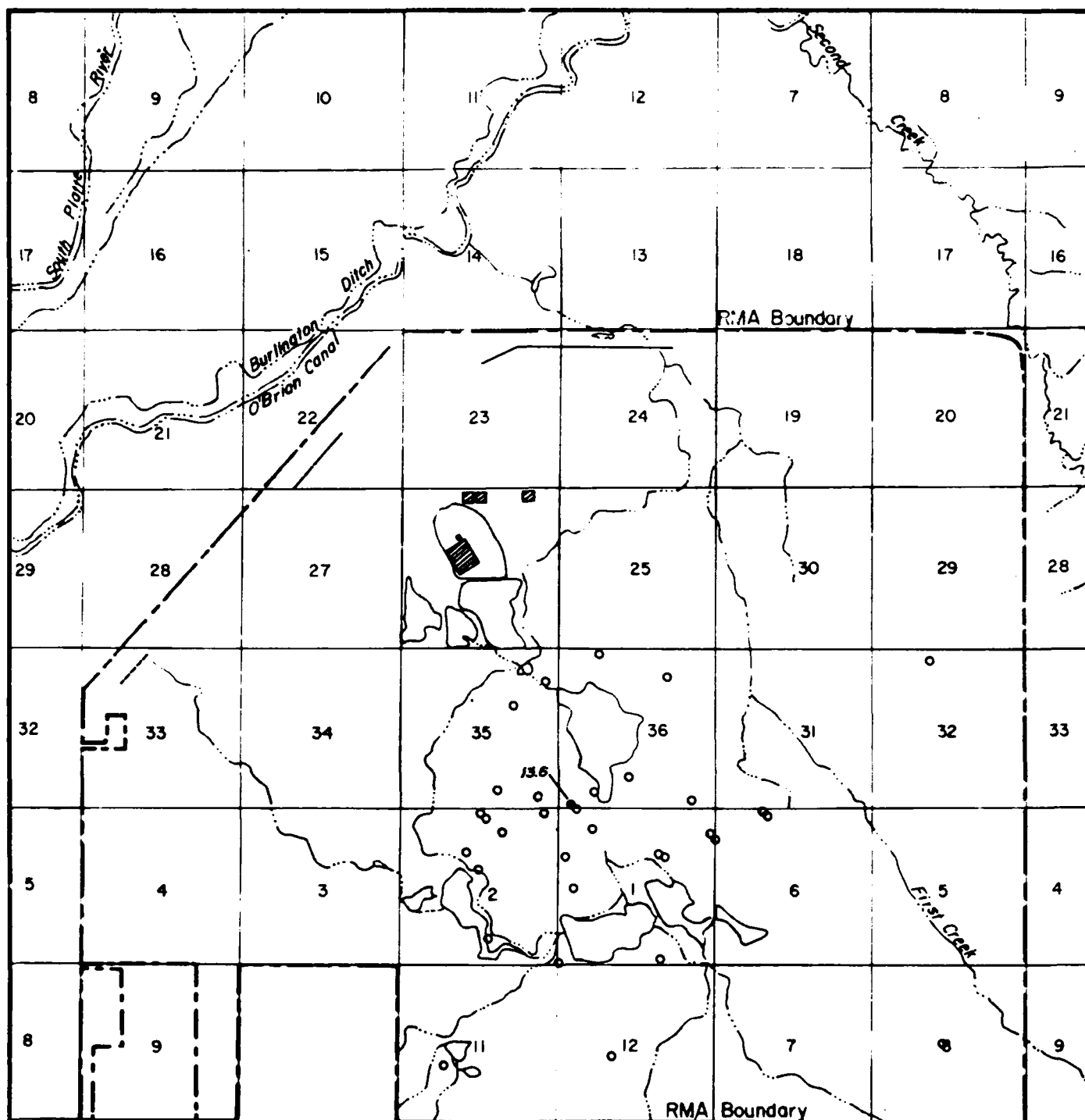
Analyte Concentration in  $\mu\text{g/l}$

Note : Open symbol  
Indicates analyte  
was not detected

0 5000 10,000 Feet  
0 1000 2000 3000 Meters

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Rocky Mountain Arsenal  
Commerce City, Colorado  
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Harding Lawson Associates

Figure A-34  
Dibromochloropropane (DBCP)  
Detections  
Denver Zones 3 & 5  
Fall 1988  
CMP GWAR FY89



### Explanation

● 13.6 Denver Zone A Well Location

— Containment System  
 — Physical Barrier  
 - - - Hydraulic Barrier

■ Basin F IRA Structure

Analyte Concentration in  $\mu\text{g/l}$

Note: Open symbol  
 Indicates analyte  
 was not detected

0 5000 10,000 Feet  
 0 1000 2000 3000 Meters

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 Commerce City, Colorado

Prepared by:

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Figure A-35

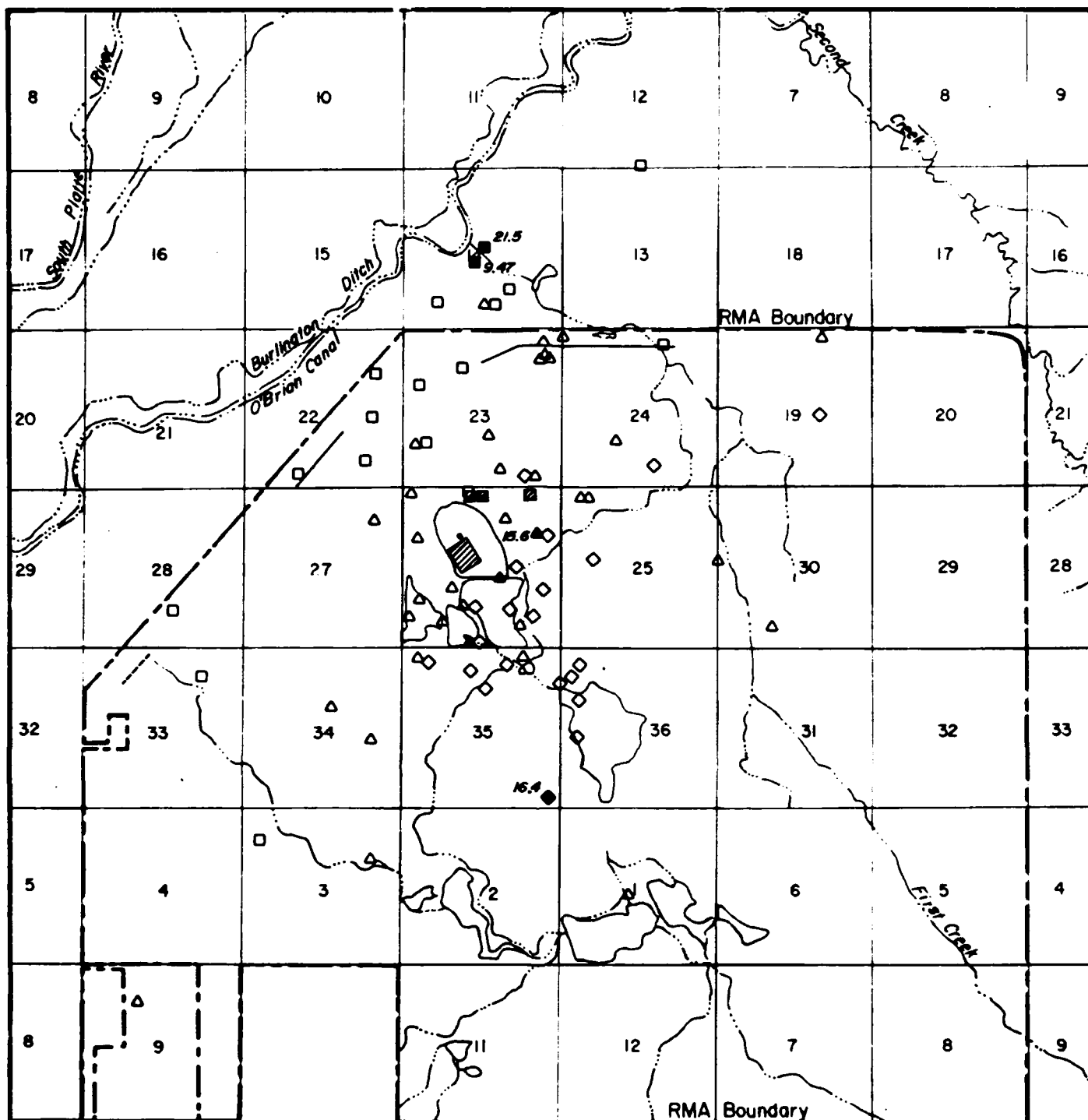
Dicyclopentadiene (DCPD)  
 Detections

Denver Zone A

Fall 1988

CMP GWAR FY89





### Explanation

- <sup>6.4</sup> Denver Zone 1 Well Location
- ▲<sup>15.6</sup> Denver Zone 2 Well Location
- <sup>21.5</sup> Denver Zone 4 Well Location
- ▣ Basin F IRA Structure

- Containment System
- Physical Barrier
- Hydraulic Barrier

### Note :

Open symbol  
Indicates analyte  
was not detected



Analyte Concentration  
in µg/l

0 5000 10,000 Feet  
0 1000 2000 3000 Meters

### Prepared for :

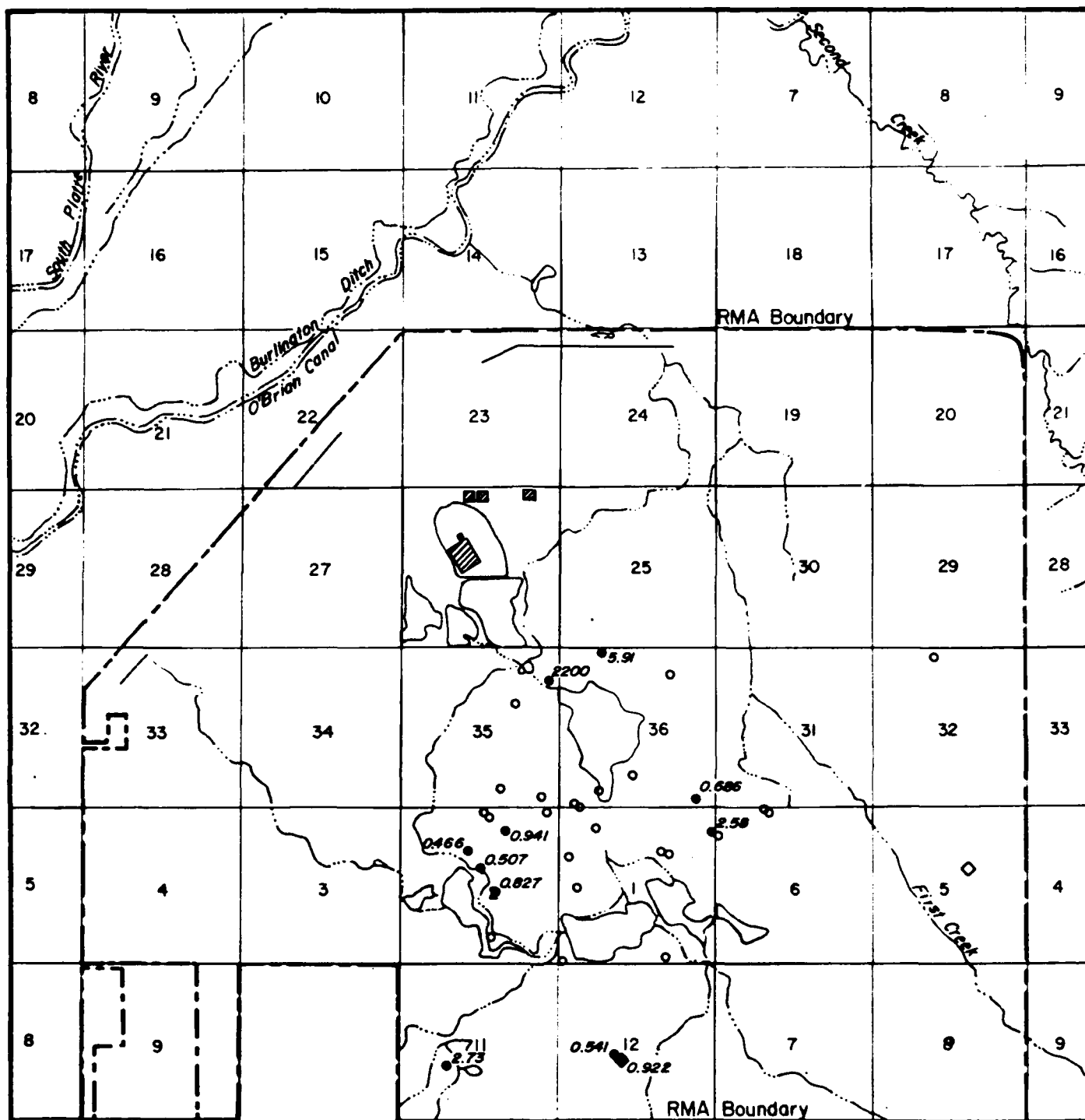
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Commerce City, Colorado

### Prepared by :

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Harding Lawson Associates

### Figure A-36

Dicyclopentadiene (DCPD)  
Detections  
Denver Zones 1, 2, & 4  
Fall 1988  
CMP GWAR FY89



### Explanation

● 0.992 Denver Zone B Well Location

● 5.91 Denver Zone A Well Location

— Containment System

— Physical Barrier

— Hydraulic Barrier

▣ Basin F IRA Structure

Analyte Concentration in µg/l

Note : Open symbol  
Indicates analyte  
was not detected

0 5000 10,000 Feet  
0 1000 2000 3000 Meters

Prepared for :

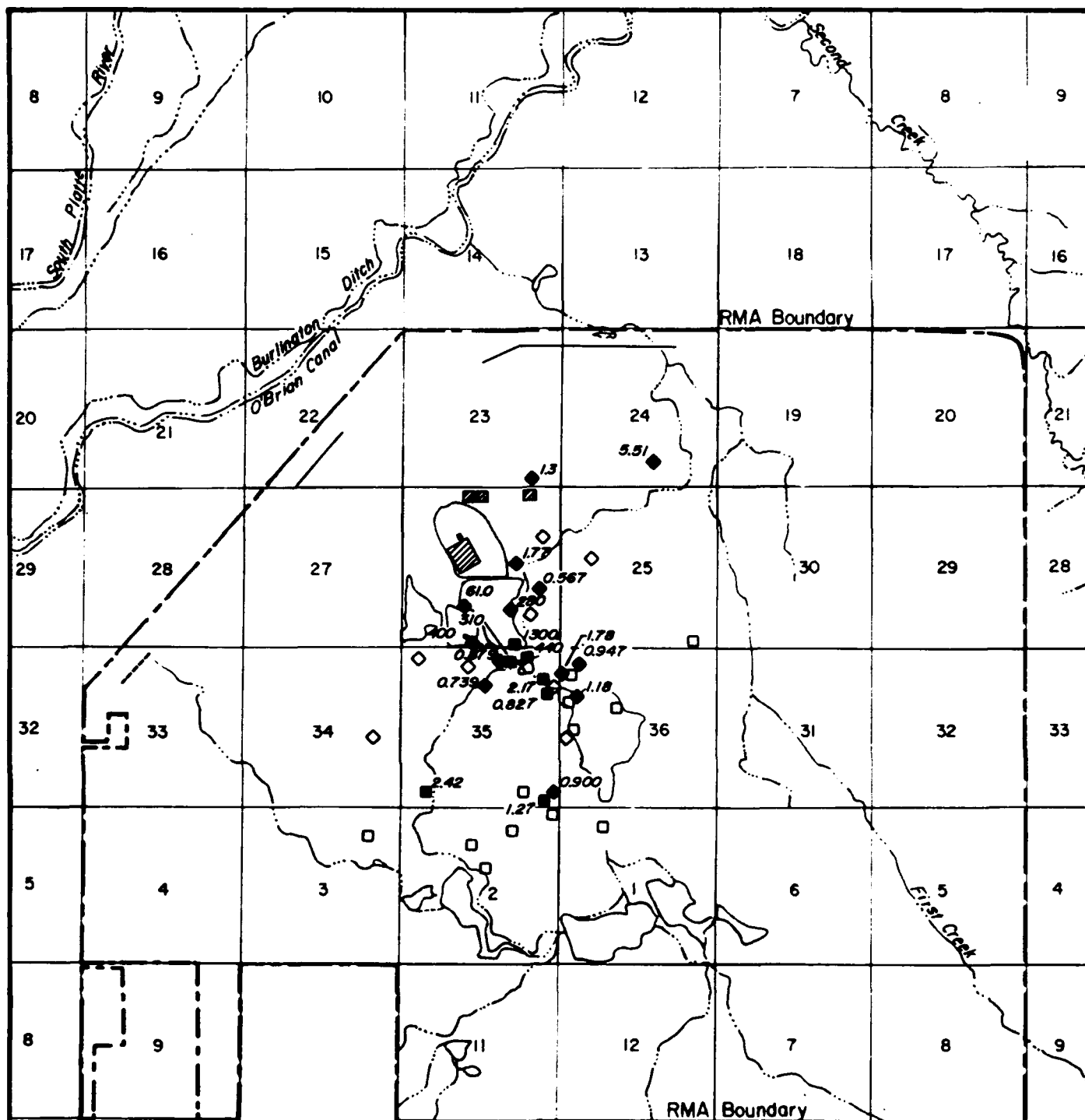
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Prepared by :

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Figure A-37

Diisopropylmethylphosphonate  
(DIMP) Detections  
Denver Zones B & A  
Fall 1988  
CMP GVAR FY89



### Explanation

- 2.17 Denver Zone 1U Well Location
- ◆ 1.77 Denver Zone 1 Well Location
- ▣ Basin F IRA Structure
- Containment System
- Physical Barrier
- Hydraulic Barrier

Analyte Concentration in µg/l

Note: Open symbol indicates analyte was not detected

0 5000 10,000 Feet  
0 1000 2000 3000 Meters

Prepared for:

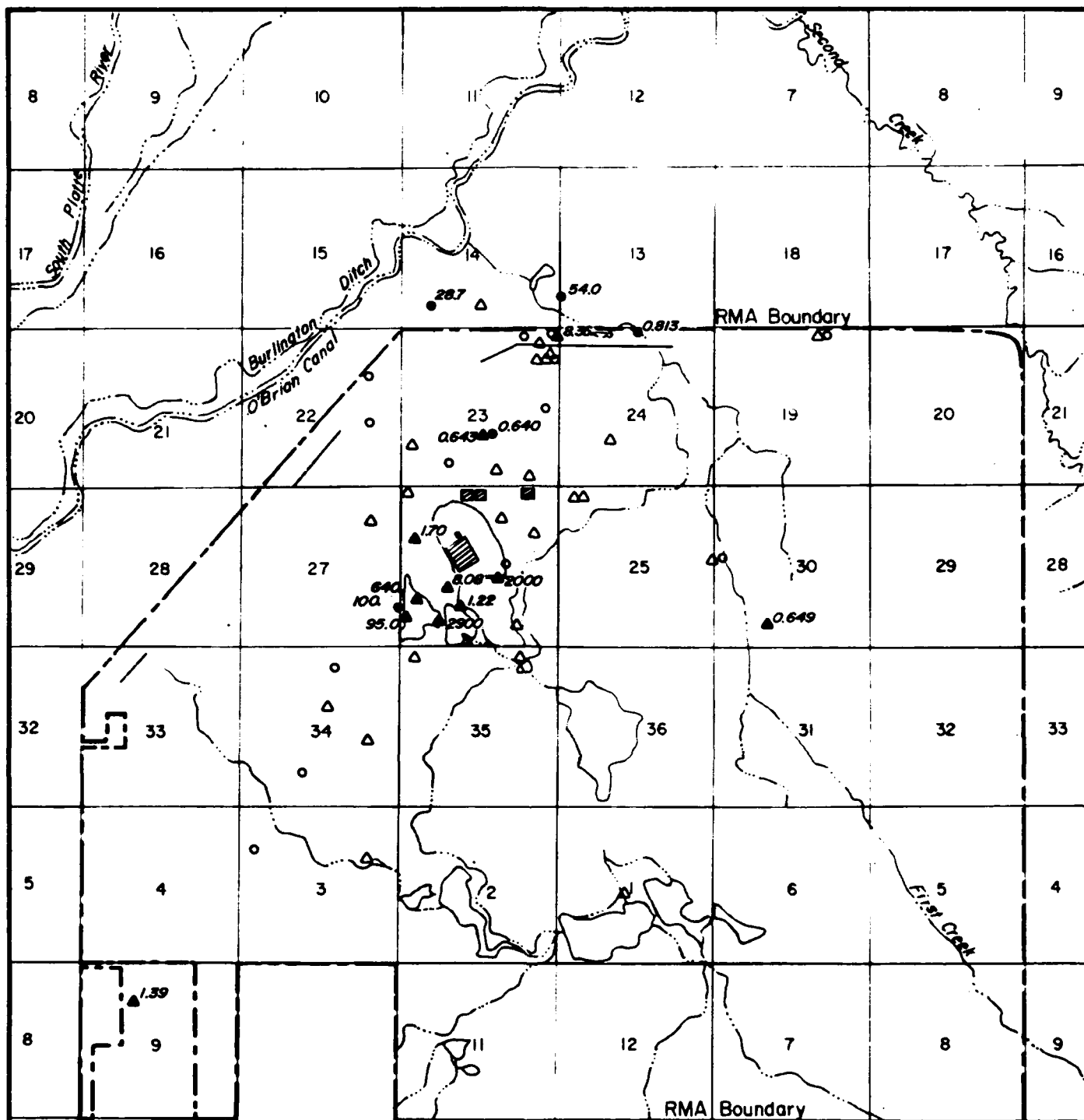
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Commerce City, Colorado

Prepared by:

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Figure A-38

Diisopropylmethylphosphonate  
(DIMP) Detections  
Denver Zones 1U & 1  
Fall 1988  
CMP GWAR FY89



### Explanation

▲ 1.70 Denver Zone 2 Well Location

● 100. Denver Zone 3 Well Location

— Containment System

— Physical Barrier

- - - Hydraulic Barrier

▨ Basin F IRA Structure

Analyte Concentration in  $\mu\text{g/l}$

Note: Open symbol  
Indicates analyte  
was not detected

0 5000 10,000 Feet  
0 1000 2000 3000 Meters

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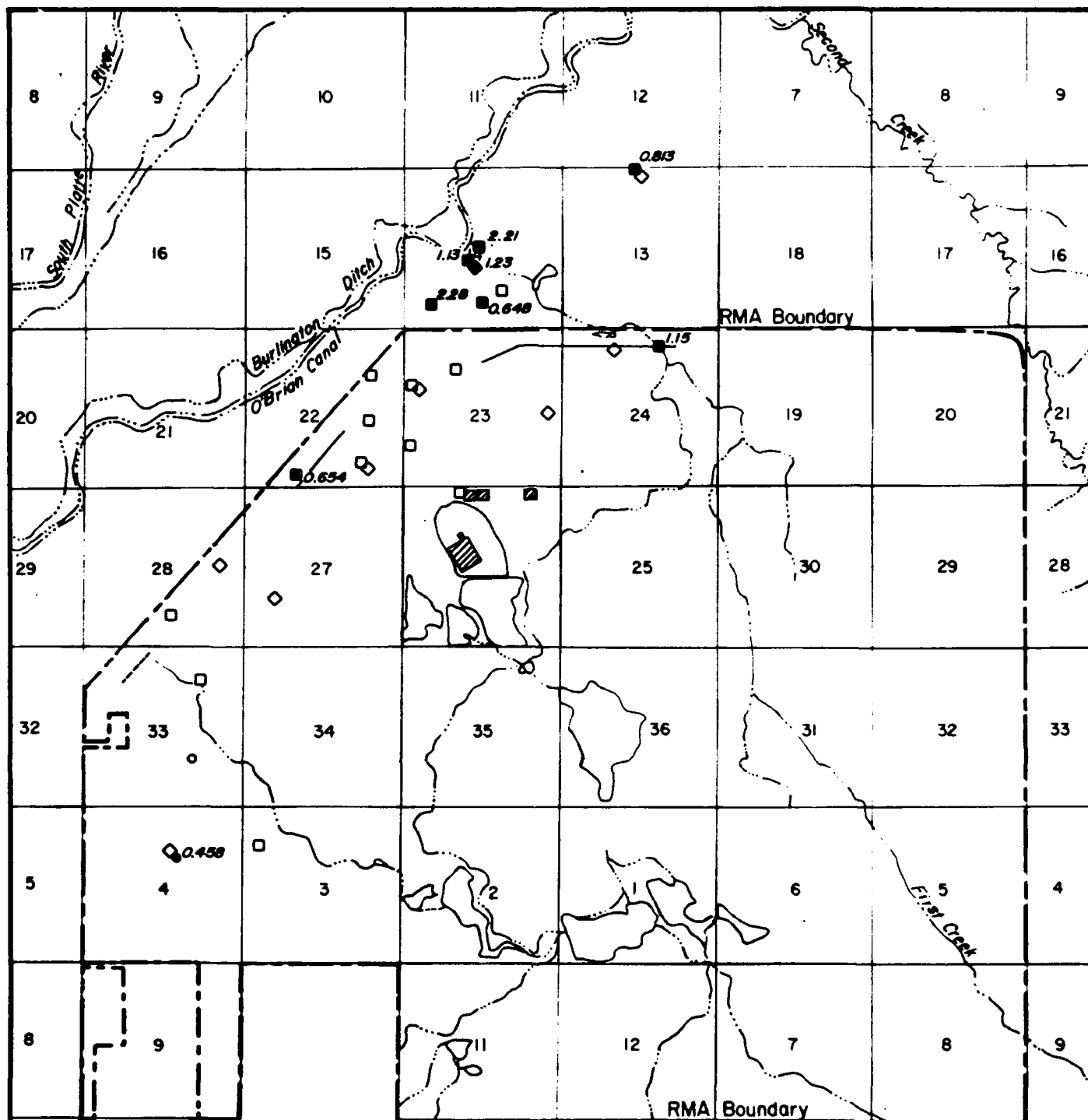
Figure A-39

Diisopropylmethylphosphonate  
(DIMP) Detections

Denver Zones 2 & 3

Fall 1988

CMP GWAR FY89



### Explanation

- 2.21 Denver Zone 4 Well Location
- ◆ 1.23 Denver Zone 5 Well Location
- 0.458 Denver Zone 6 Well Location

▣ Basin F IRA Structure

— Containment System  
 — Physical Barrier  
 — Hydraulic Barrier

Note :

Open symbol  
 Indicates analyte  
 was not detected

Analyte Concentration  
 in µg/l

0 5000 10,000 Feet  
 0 1000 2000 3000 Meters

Prepared for :

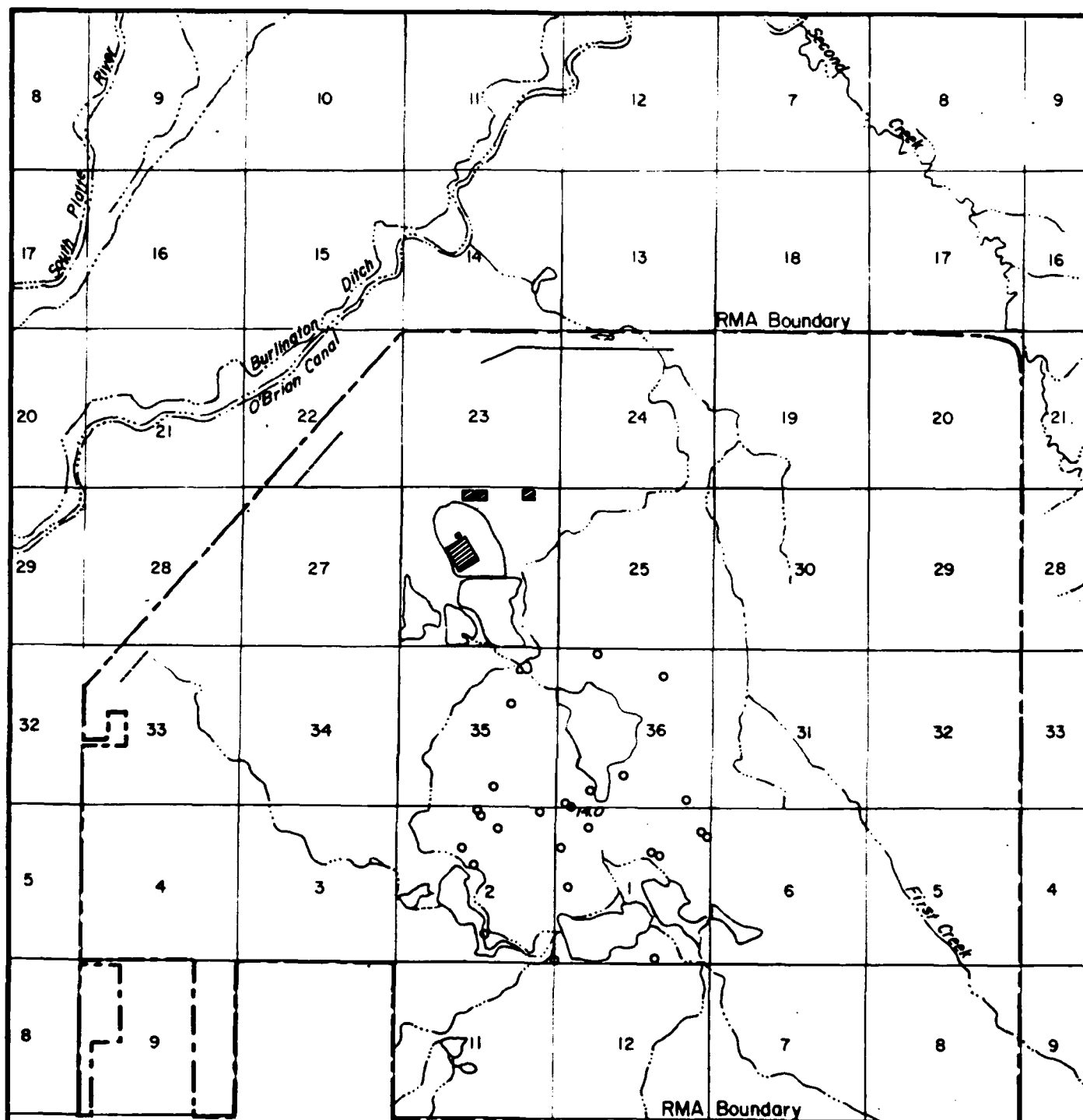
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Figure A-40

Diisopropylmethylphosphonate  
 (DIMP) Detections  
 Denver Zones 4, 5, & 6  
 Fall 1988  
 CMP GWAR FY89



### Explanation

● 140 Denver Zone A Well Location

— Containment System

— Physical Barrier

— Hydraulic Barrier

▣ Basin F IRA Structure

Analyte Concentration in  $\mu\text{g/l}$

Note : Open symbol  
Indicates analyte  
was not detected

0 5000 10,000 Feet  
0 1000 2000 3000 Meters

Prepared for :

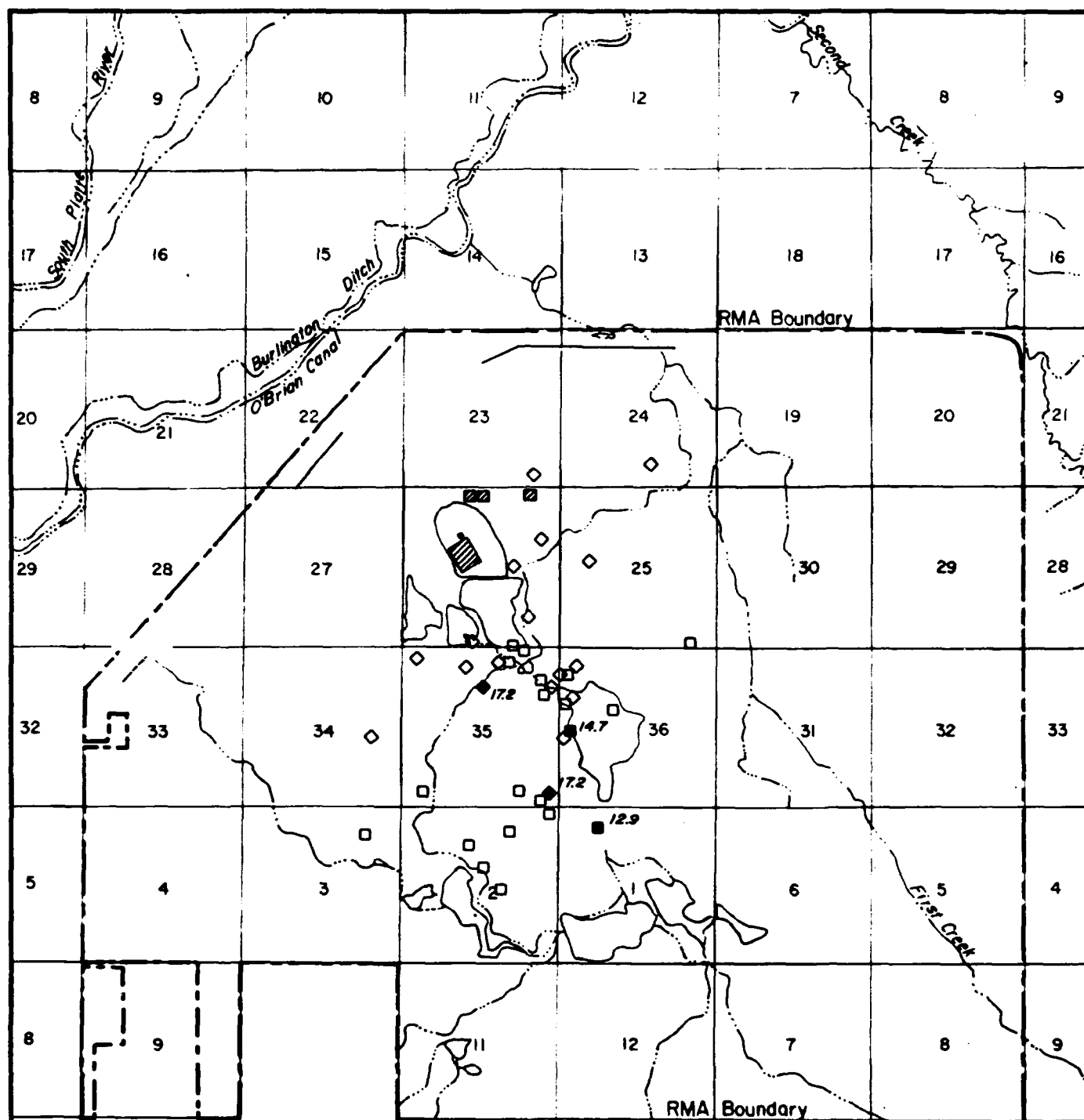
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Prepared by :

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Figure A-41

Phenol Detections  
Denver Zone A  
Fall 1988  
CMP QWAR FY89



### Explanation

■ **14.7** Denver Zone 1U Well Location

◆ **17.2** Denver Zone 1 Well Location

▨ Bash F IRA Structure

— Containment System

- - - Physical Barrier

... Hydraulic Barrier

Analyte Concentration in µg/l

Note : Open symbol  
Indicates analyte  
was not detected

0 5000 10,000 Feet  
0 1000 2000 3000 Meters

Prepared for :

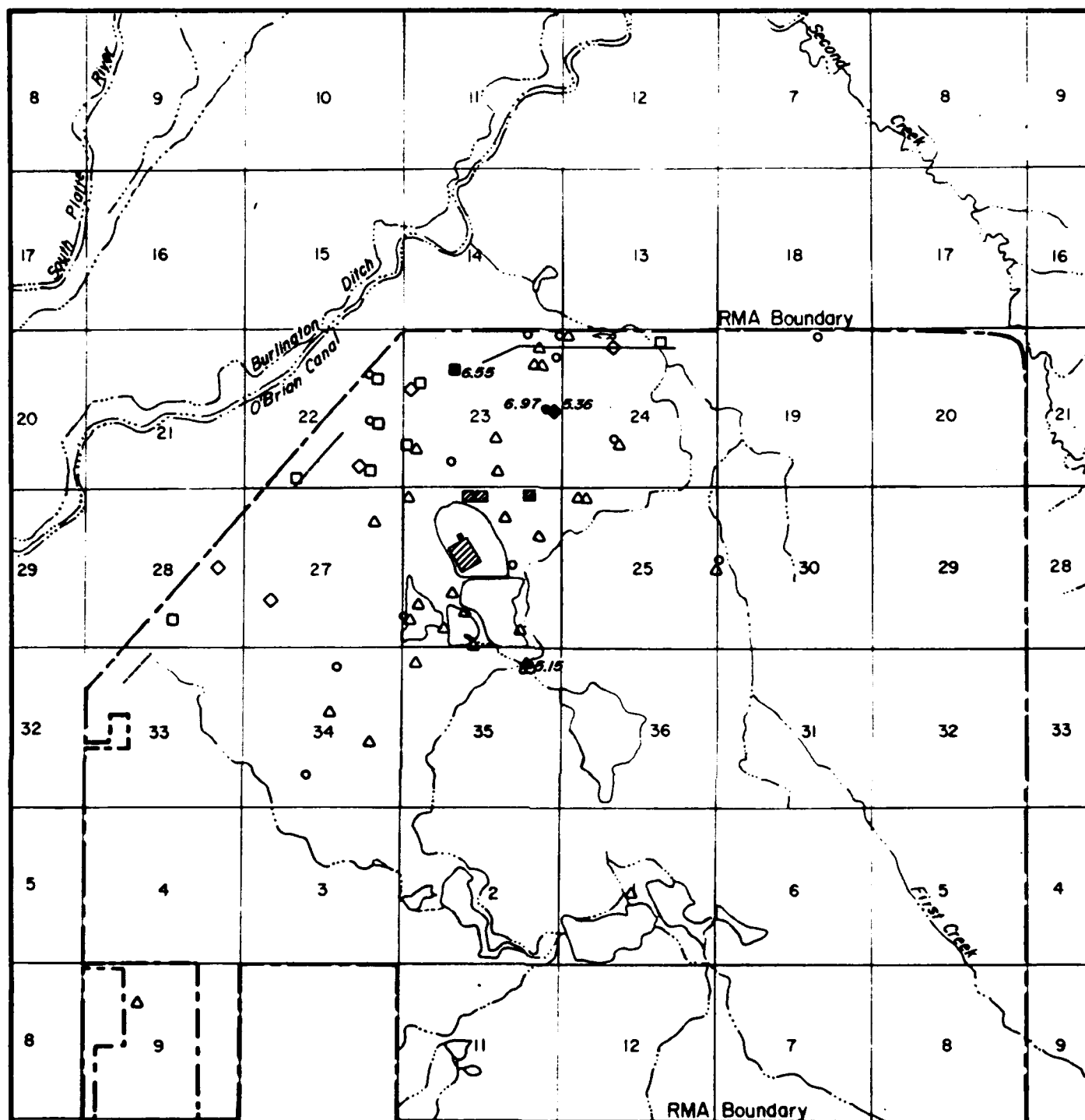
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Commerce City, Colorado

Prepared by :

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Harding Lawson Associates

Figure A-42

**Phenol Detections**  
**Denver Zones 1U & 1**  
**Fall 1988**  
**CMP GVAR FY89**



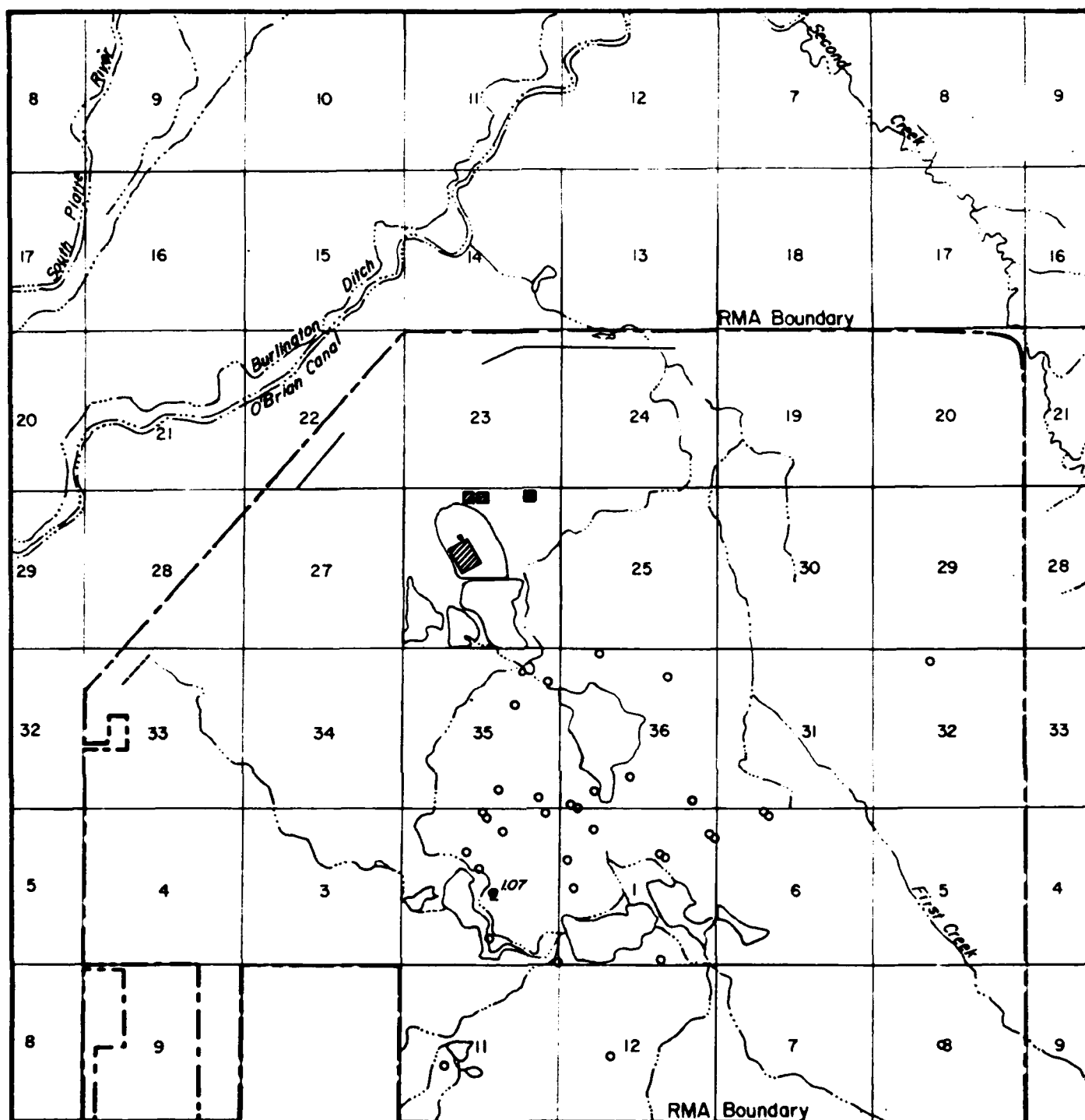
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Prepared by:  
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Harding Lawson Associates

Figure A-43

**Phenol Detections**  
**Denver Zones 2, 3, 4, & 5**  
**Fall 1988**  
**CMP GVAR FY89**





### Explanation

● 107 Denver Zone A Well Location

- Containment System
- Physical Barrier
- Hydraulic Barrier
- ▣ Basin F IRA Structure

Analyte Concentration in  $\mu\text{g/l}$

Note : Open symbol indicates  
analyte was not  
detected

0 5000 10,000 Feet  
0 1000 2000 3000 Meters

Prepared for :

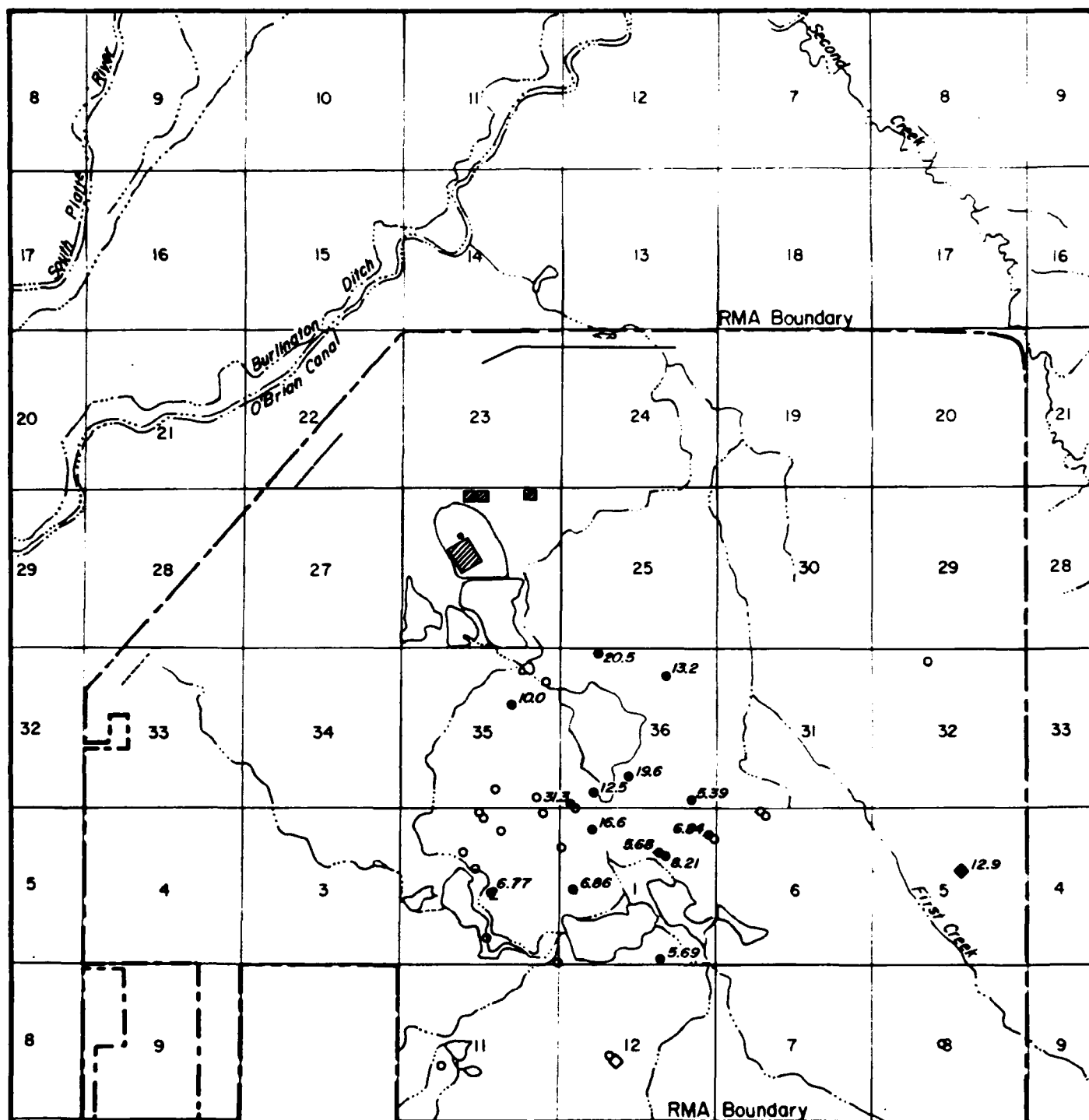
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Commerce City, Colorado

Prepared by :

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Harding Lawson Associates

Figure A-44

Parathion Detections  
Denver Zone A  
Fall 1988  
CMP GWAR FY89



### Explanation

● 12.9 Denver Zone B Well Location

○ 100 Denver Zone A Well Location

— Containment System  
 — Physical Barrier  
 — Hydraulic Barrier

■ Basin F IRA Structure

Analyte Concentration in ug/l

Note: Open symbol

Indicates analyte  
 was not detected



0 5000 10,000 Feet  
 0 1000 2000 3000 Meters

Prepared for:

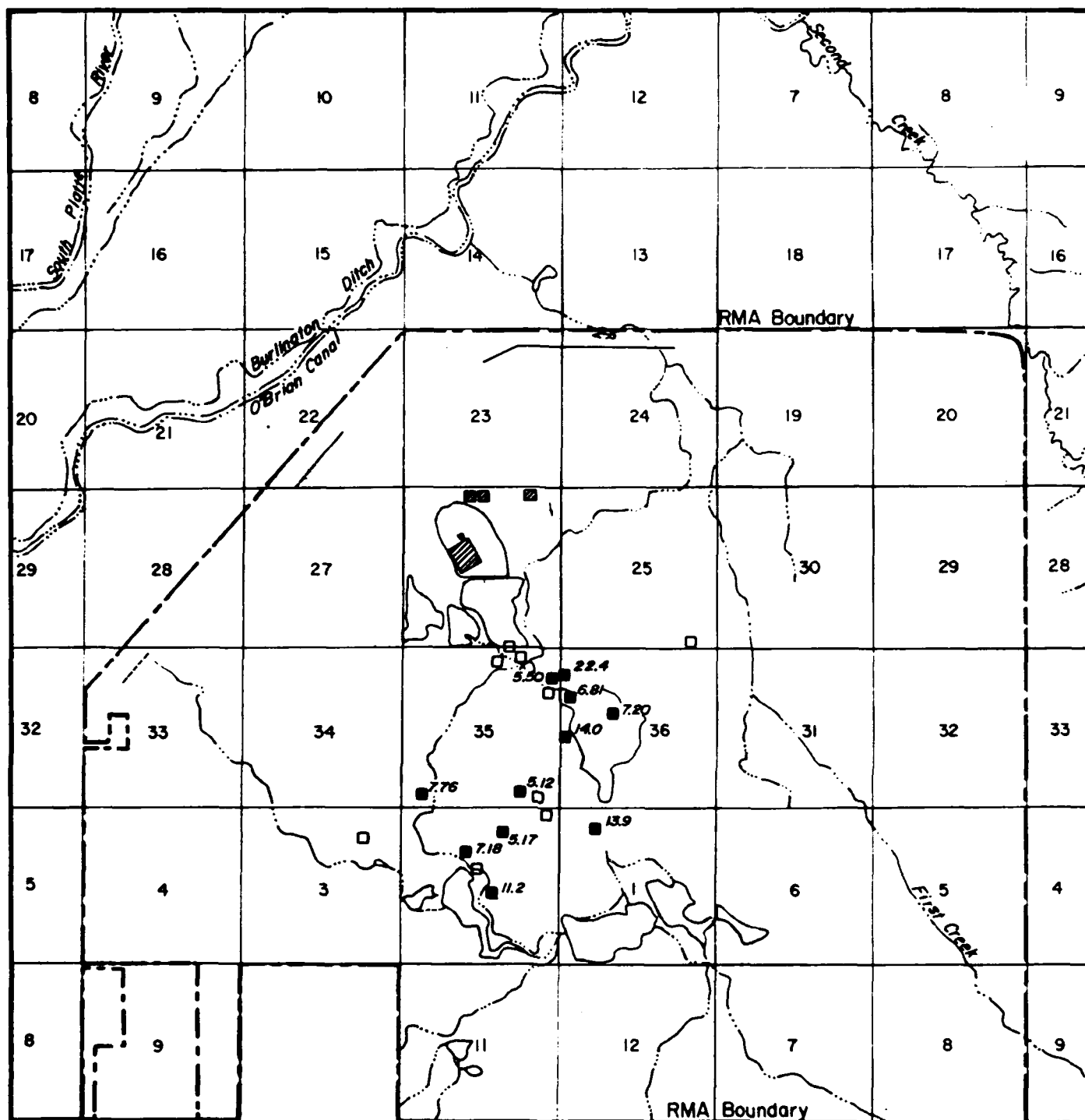
U.S. Army Program Manager for  
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Prepared by:

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Figure A-45

Cyanide Detections  
 Denver Zones B & A  
 Fall 1988  
 CMP GVAR FY89



### Explanation

■ 5.12 Denver Zone 1U Well Location

▣ Basin F MRA Structure

— Containment System

— Physical Barrier

— Hydraulic Barrier

Analyte Concentration in µg/l

Note: Open symbol indicates analyte was not detected



0 5000 10,000 Feet  
0 1000 2000 3000 Meters

Prepared for:

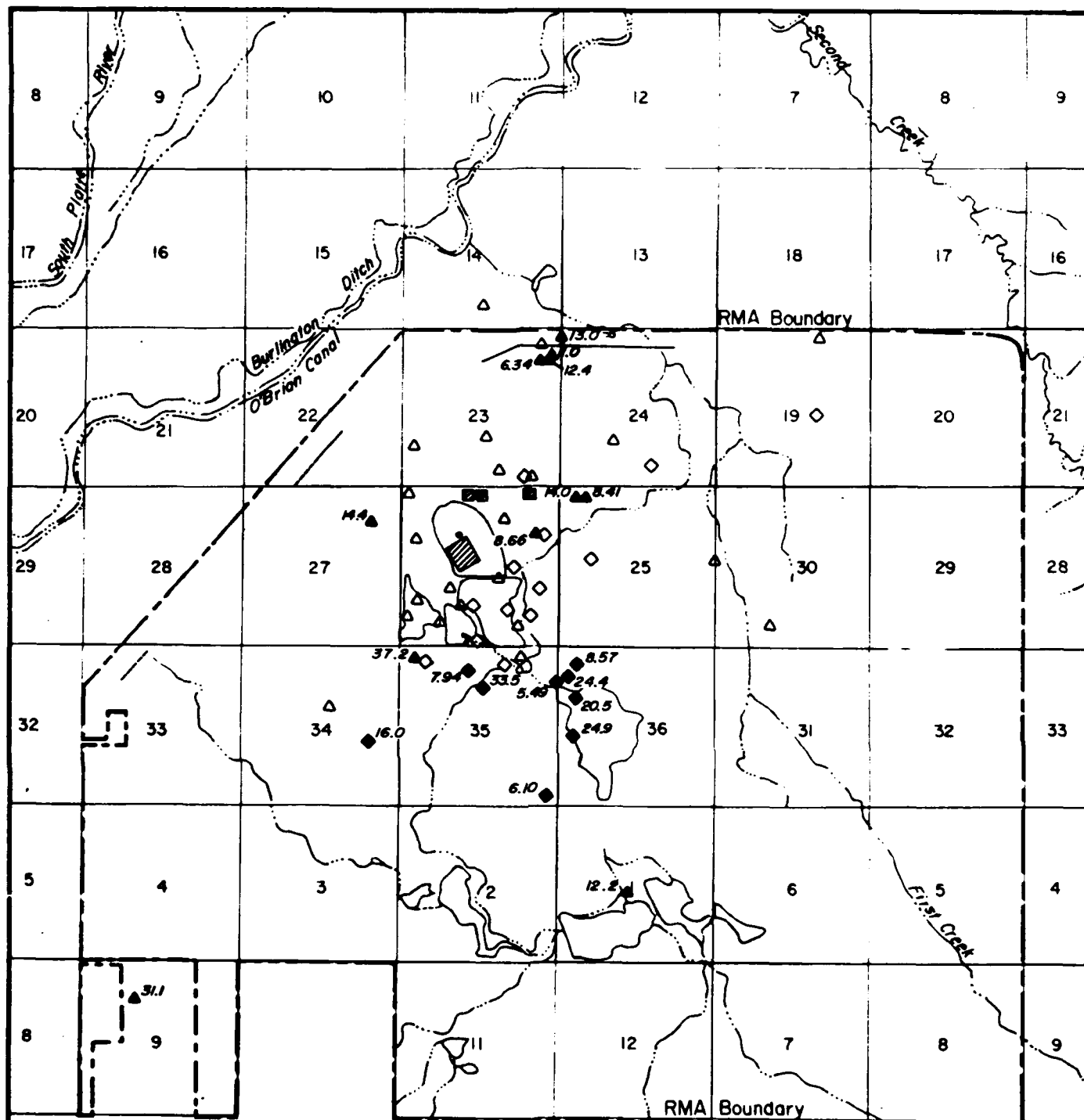
U.S. Army Program Manager for  
Rocky Mountain Arsenal  
Commerce City, Colorado

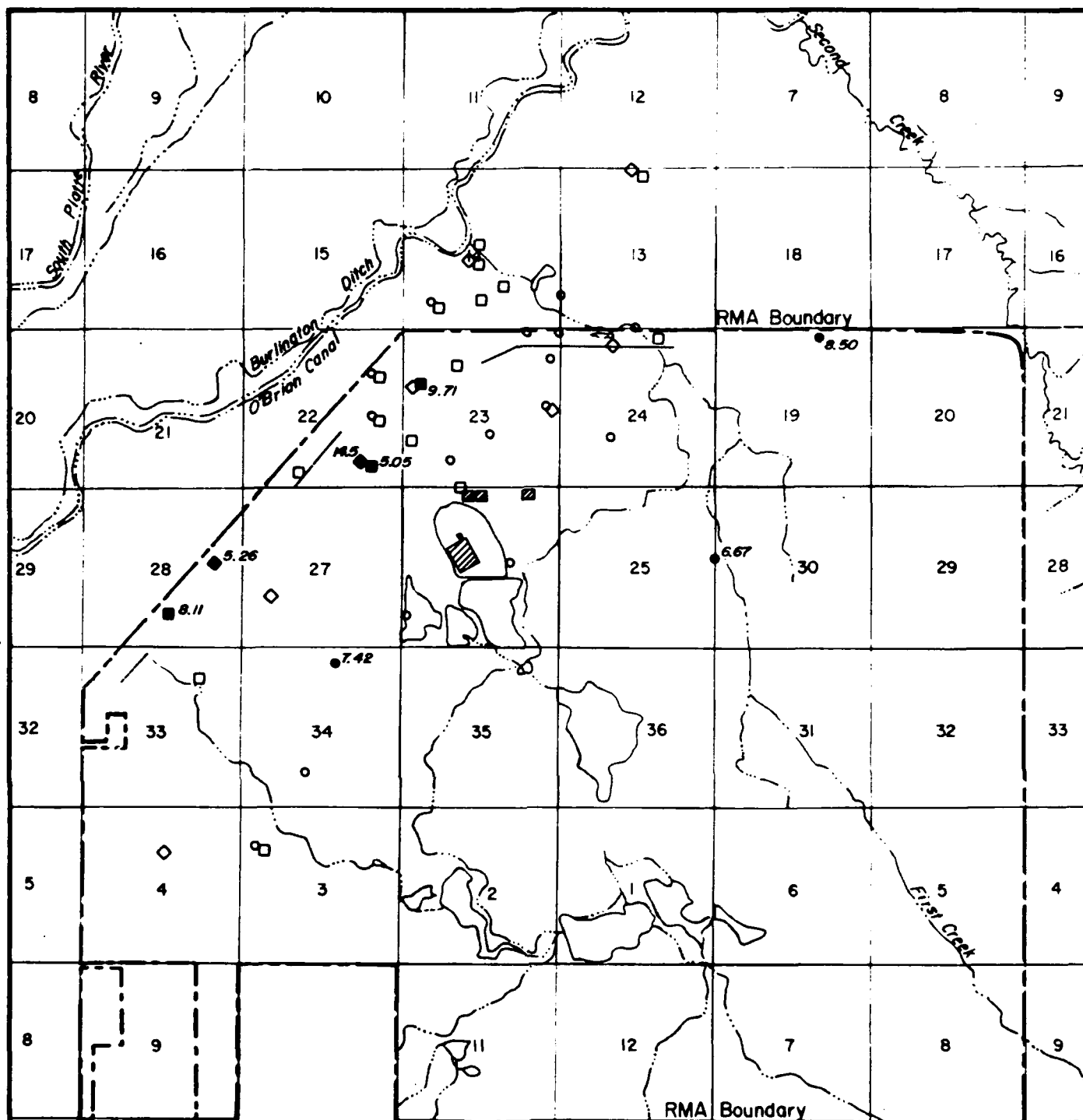
Prepared by:

R.L. Steller & Associates, Inc.  
Herdin Lawson Associates

Figure A-46

Cyanide Detections  
Denver Zone 1U  
Fall 1988  
CMP GWAR FY89





### Explanation

- 8.50 Denver Zone 3 Well Location
- 9.71 Denver Zone 4 Well Location
- ◆ 4.5 Denver Zone 5 Well Location
- ▨ Basin F IRA Structure

— Containment System  
 — Physical Barrier  
 - - - Hydraulic Barrier

Analyte Concentration  
 In  $\mu\text{g/l}$

Note :  
 Open symbol  
 Indicates analyte  
 was not detected



0 5000 10,000 Feet  
 0 1000 2000 3000 Meters

Prepared for :

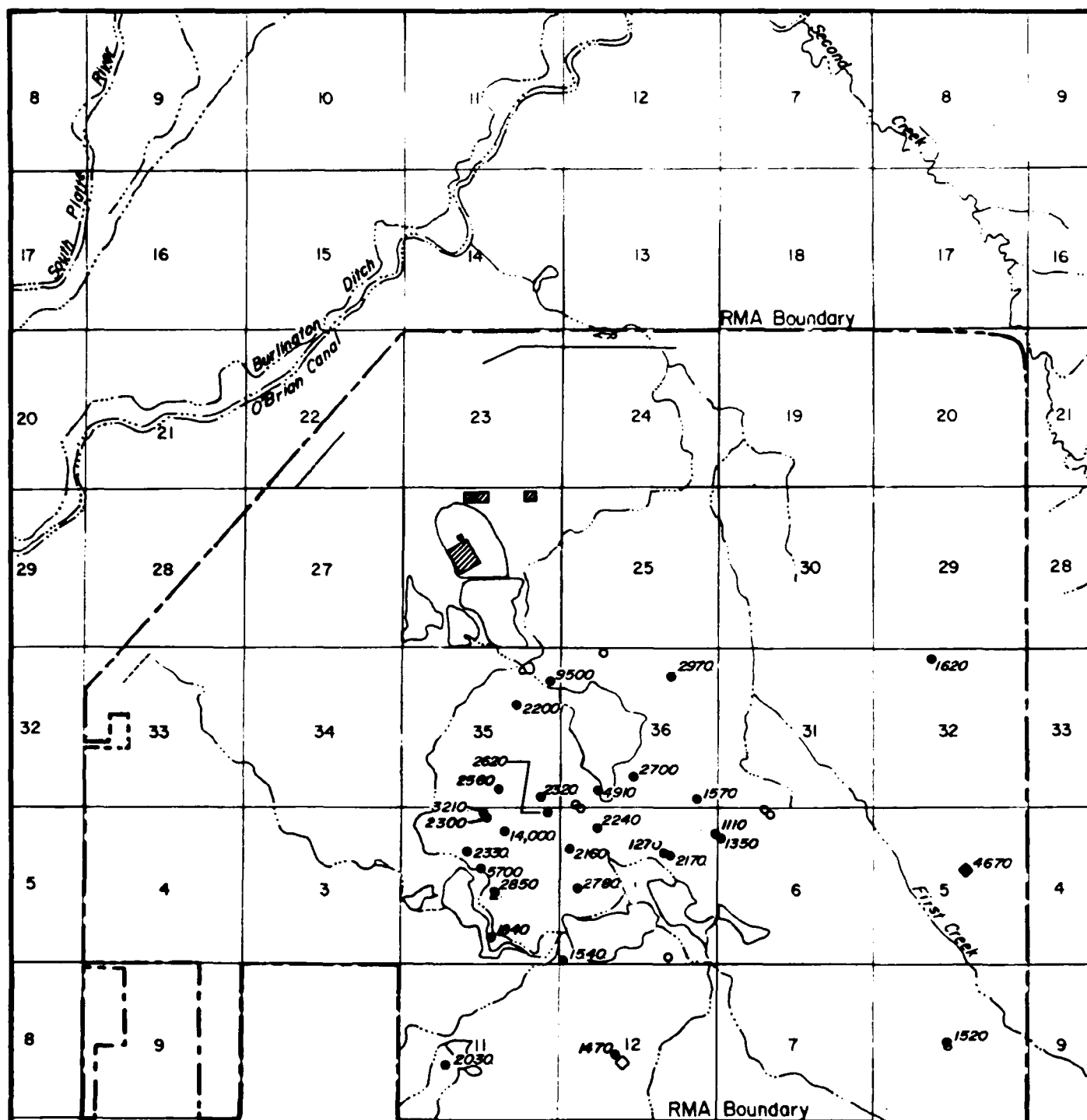
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Figure A-48

Cyanide Detections  
 Denver Zones 3, 4, & 5  
 Fall 1988  
 CMP GWAR FY89



### Explanatic

◆ 46700 Denver Zone B Well Location

● 13200 Denver Zone A Well Location

— Containment System  
 — Physical Barrier  
 — Hydraulic Barrier

■ Basin F MRA Structure

Analyte Concentration in µg/l

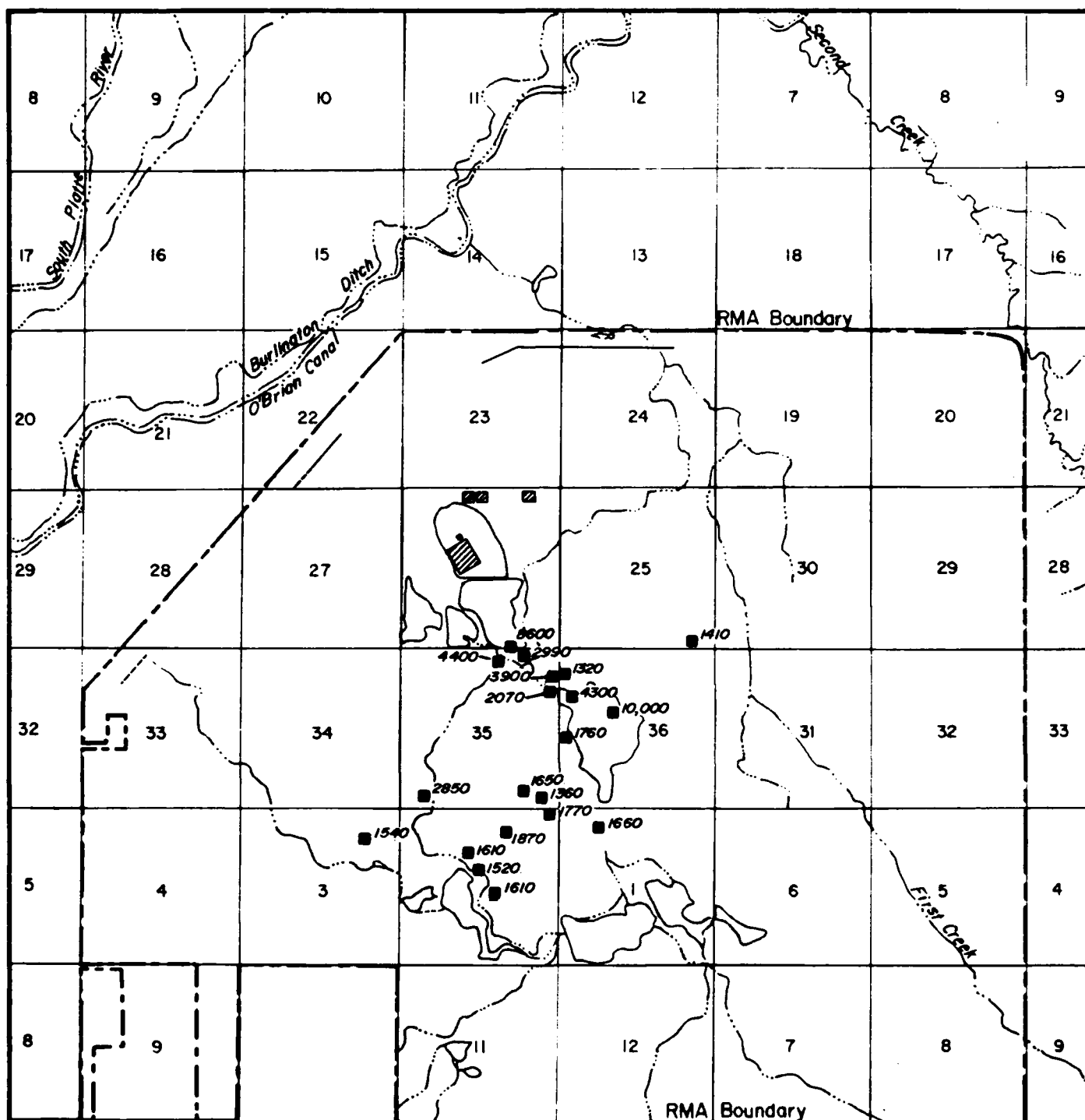
Note: Open symbol  
 indicates analyte  
 was not detected

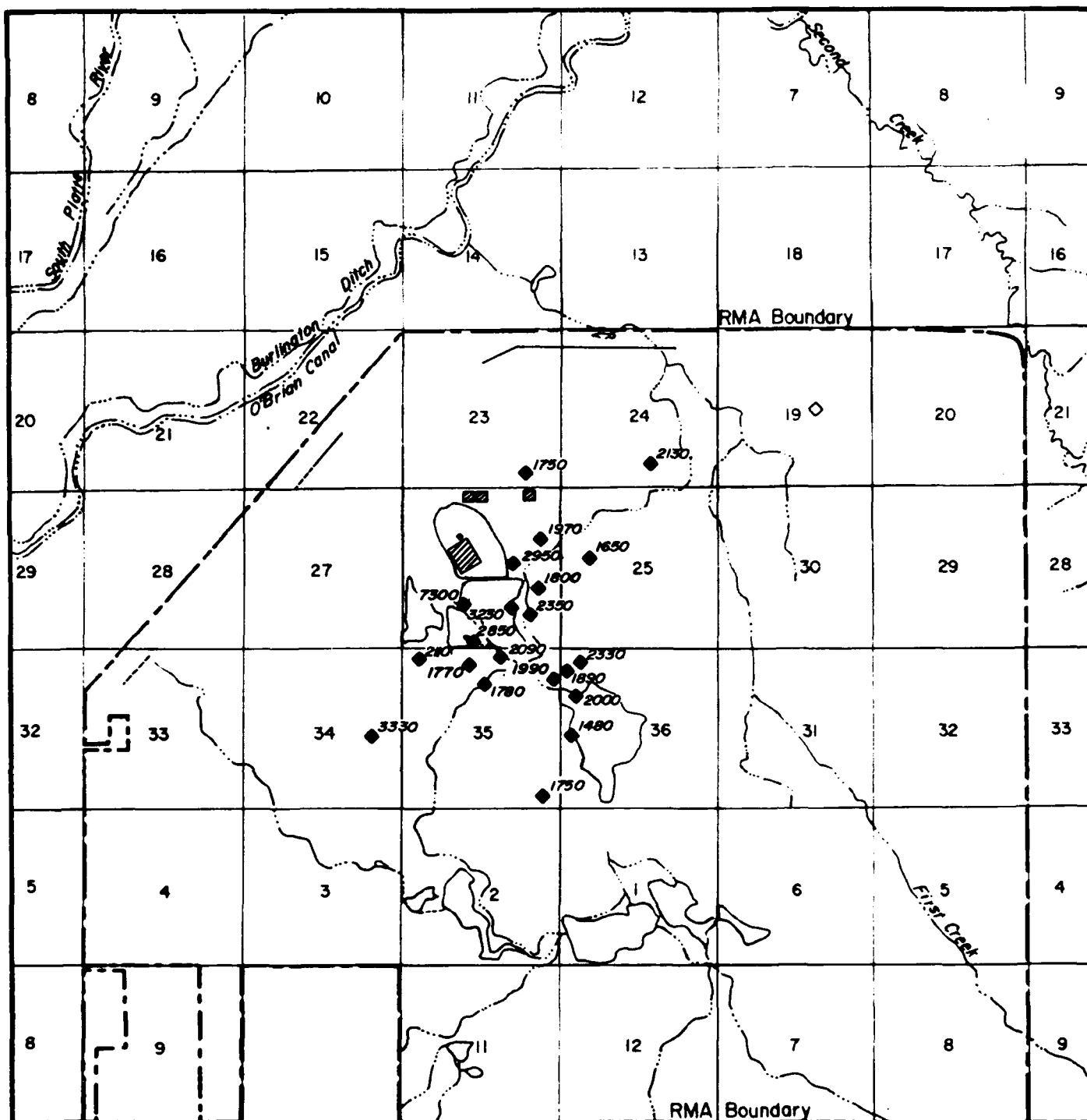
0 5000 10,000 Feet  
 0 1000 2000 3000 Meters

Prepared for:  
 U.S. Army Program Manager for  
 Rocky Mountain Arsenal  
 Commerce City, Colorado  
 Prepared by:  
 R.L. Stellar & Associates, Inc.  
 Harding Lawson Associates

Figure A-49

Fluoride Detections  
 Denver Zones B & A  
 Fall 1988  
 CMP GVAR FY89





### Explanation

◆ 1730 Denver Zone 1 Well Location

— Containment System

— Physical Barrier

— Hydraulic Barrier

▣ Basin F IRA Structure

Analyte Concentration in  $\mu\text{g/l}$

Note : Open symbol  
indicates analyte  
was not detected

0 5000 10,000 Feet  
0 1000 2000 3000 Meters

Prepared for :

U.S. Army Program Manager for  
Rocky Mountain Arsenal  
Commerce City, Colorado

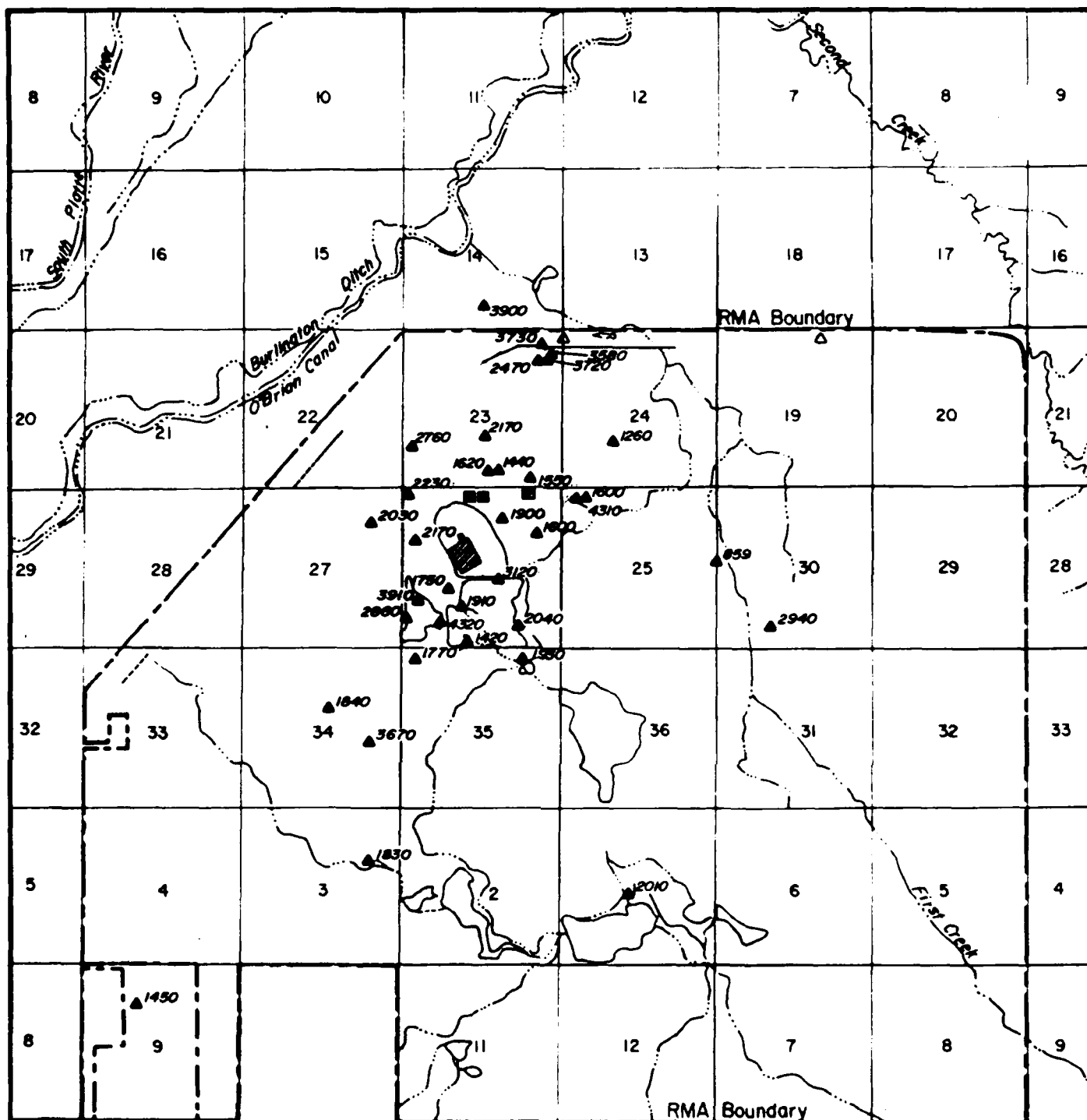
Prepared by :

R.L. Stollar & Associates, Inc.  
Harding Lawson Associates

Figure A-51

Fluoride Detections  
Denver Zone 1  
Fall 1988  
CMP GVAR FY89





### Explanation

▲ 8590 Denver Zone 2 Well Location

— Containment System

— Physical Barrier

- - - Hydraulic Barrier

□ Basin F IRA Structure

Analyte Concentration in µg/l

Note: Open symbol  
indicates analyte  
was not detected

0 5000 10,000 Feet  
0 1000 2000 3000 Meters

Prepared for:

U.S. Army Program Manager for  
Rocky Mountain Arsenal  
Commerce City, Colorado

Prepared by:

R.L. Stoller & Associates, Inc.  
Harding Lawson Associates

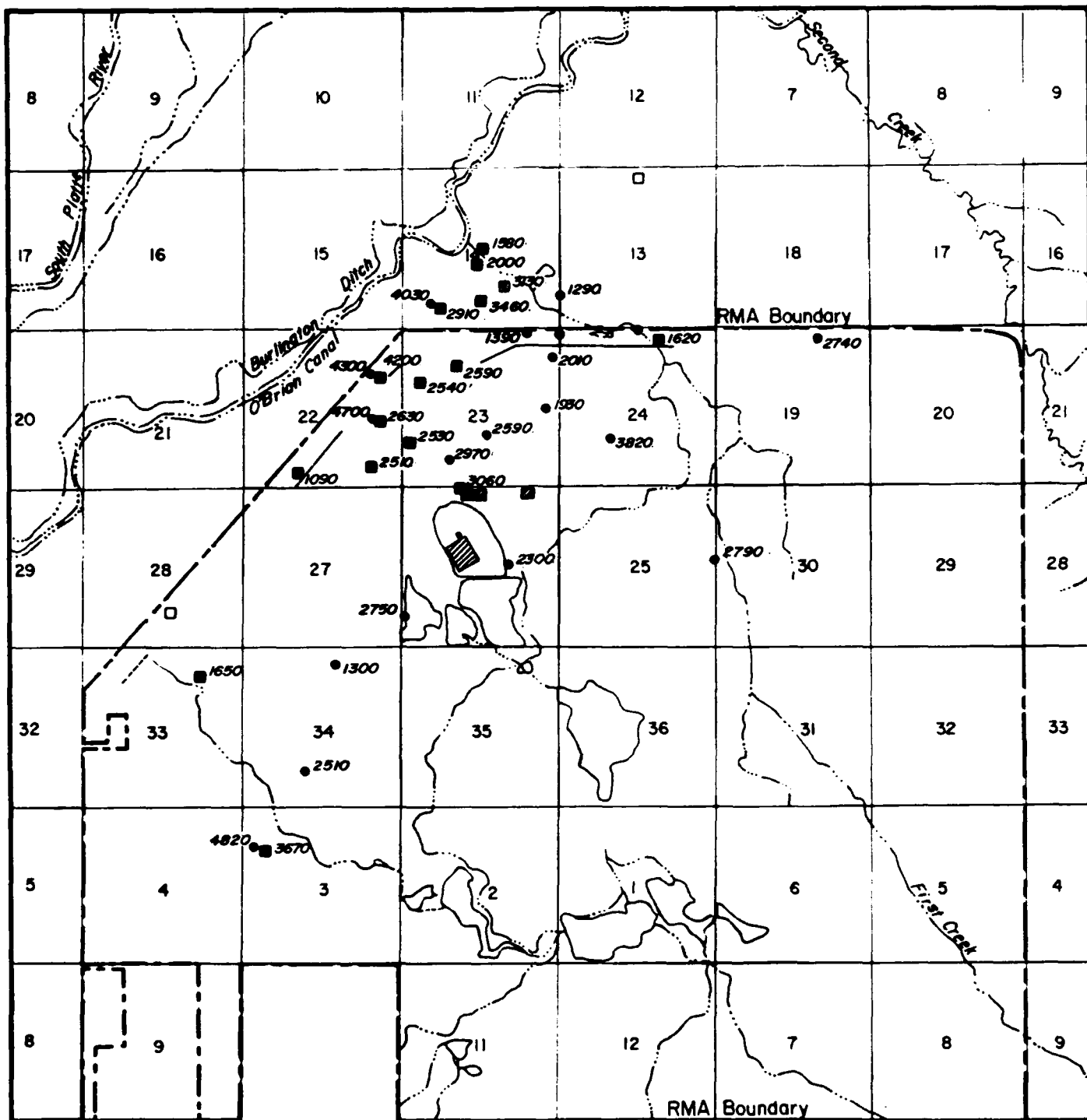
Figure A-52

Fluoride Detections

Denver Zone 2

Fall 1988

CMP GWAR FY89



### Explanation

● 12900 Denver Zone 3 Well Location

■ 30600 Denver Zone 4 Well Location

▣ Basin F IRA Structure

— Containment System

— Physical Barrier

— Hydraulic Barrier

Analyte Concentration in mg/l

Note : Open symbol  
Indicates analyte  
was not detected

0 5000 10,000 Feet  
0 1000 2000 3000 Meters

Prepared for :

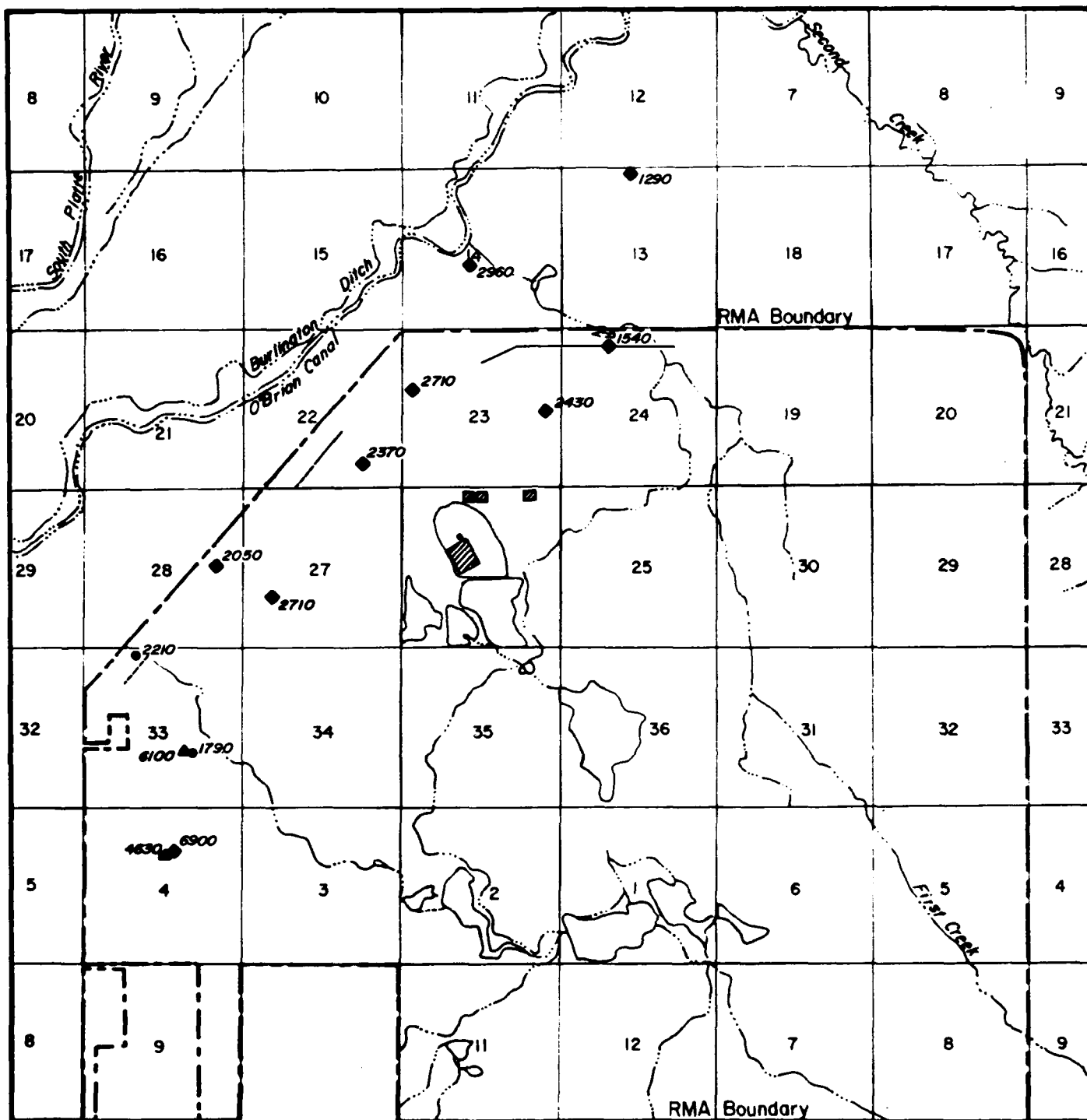
U.S. Army Program Manager for  
Rocky Mountain Arsenal  
Commerce City, Colorado

Prepared by :

R.L. Stoller & Associates, Inc.  
Harding Lawson Associates

Figure A-53

Fluoride Detections  
Denver Zones 3, & 4  
Fall 1988  
CMP GVAR FY89



### Explanation

- 1290 Denver Zone 5 Well Location
- 6100 Denver Zone 6 Well Location
- 2210 Denver Zone 7 Well Location

Containment System

Physical Barrier

Hydraulic Barrier

Basin F RRA Structure

Note: Open symbol indicates analyte was not detected

Analyte concentration in ug/l

0 5000 10,000 Feet  
0 1000 2000 3000 Meters

Prepared for:

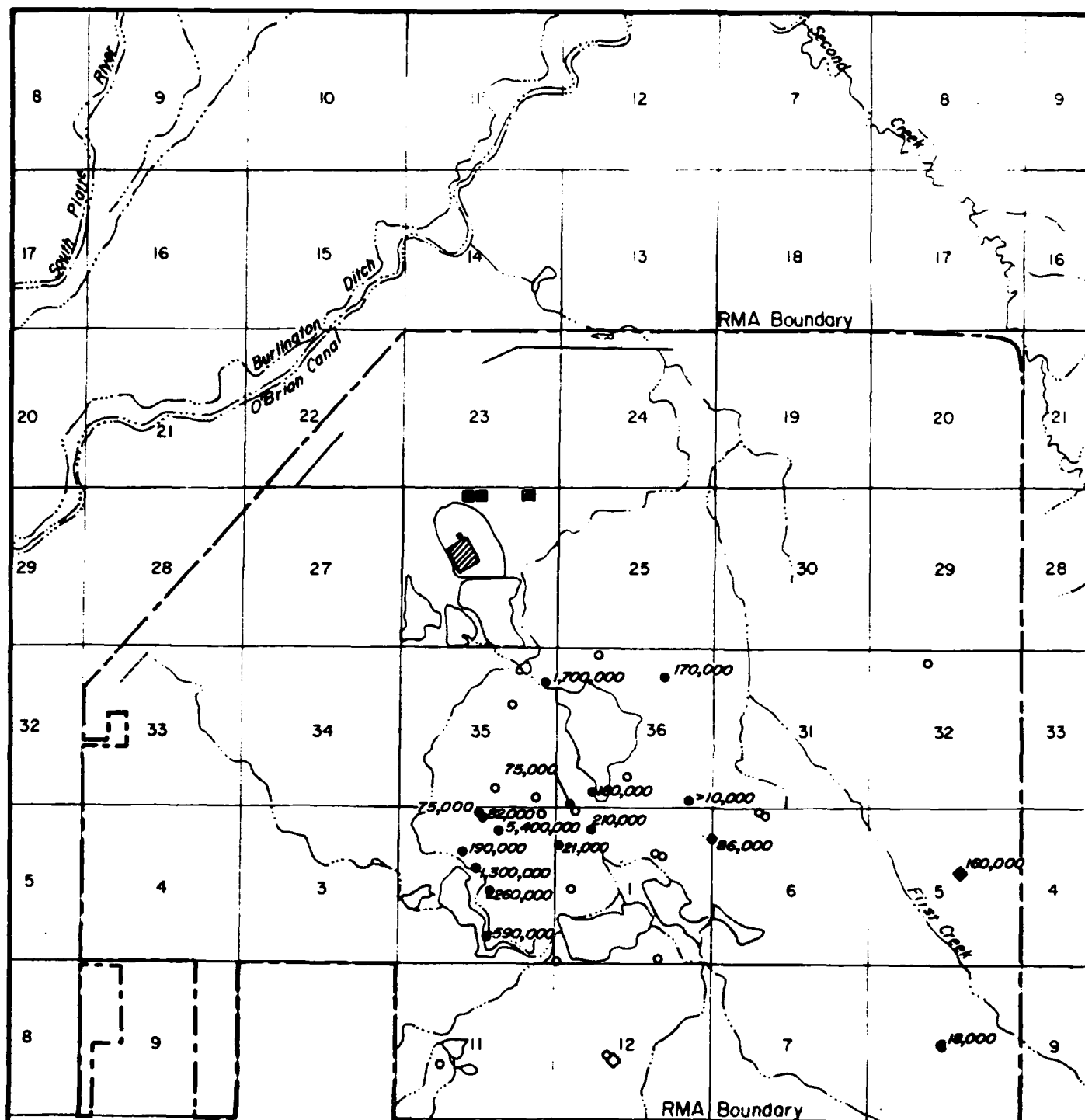
U.S. Army Program Manager for  
Rocky Mountain Arsenal  
Commerce City, Colorado

Prepared by:

R.L. Steller & Associates, Inc.  
Harding Lawson Associates

Figure A-54

Fluoride Detections  
Denver Zones 5, 6, & 7  
Fall 1988  
CMP GVAR FY89



### Explanation

- 1,700,000 Denver Zone B Well Location
- 86,000 Denver Zone A Well Location
- Containment System
- Physical Barrier
- Hydraulic Barrier
- ▣ Basin F IRA Structure

Analyte Concentration in µg/l

Note: Open symbol  
Indicates analyte  
was not detected

0 5000 10,000 Feet  
0 1000 2000 3000 Meters

Prepared for:

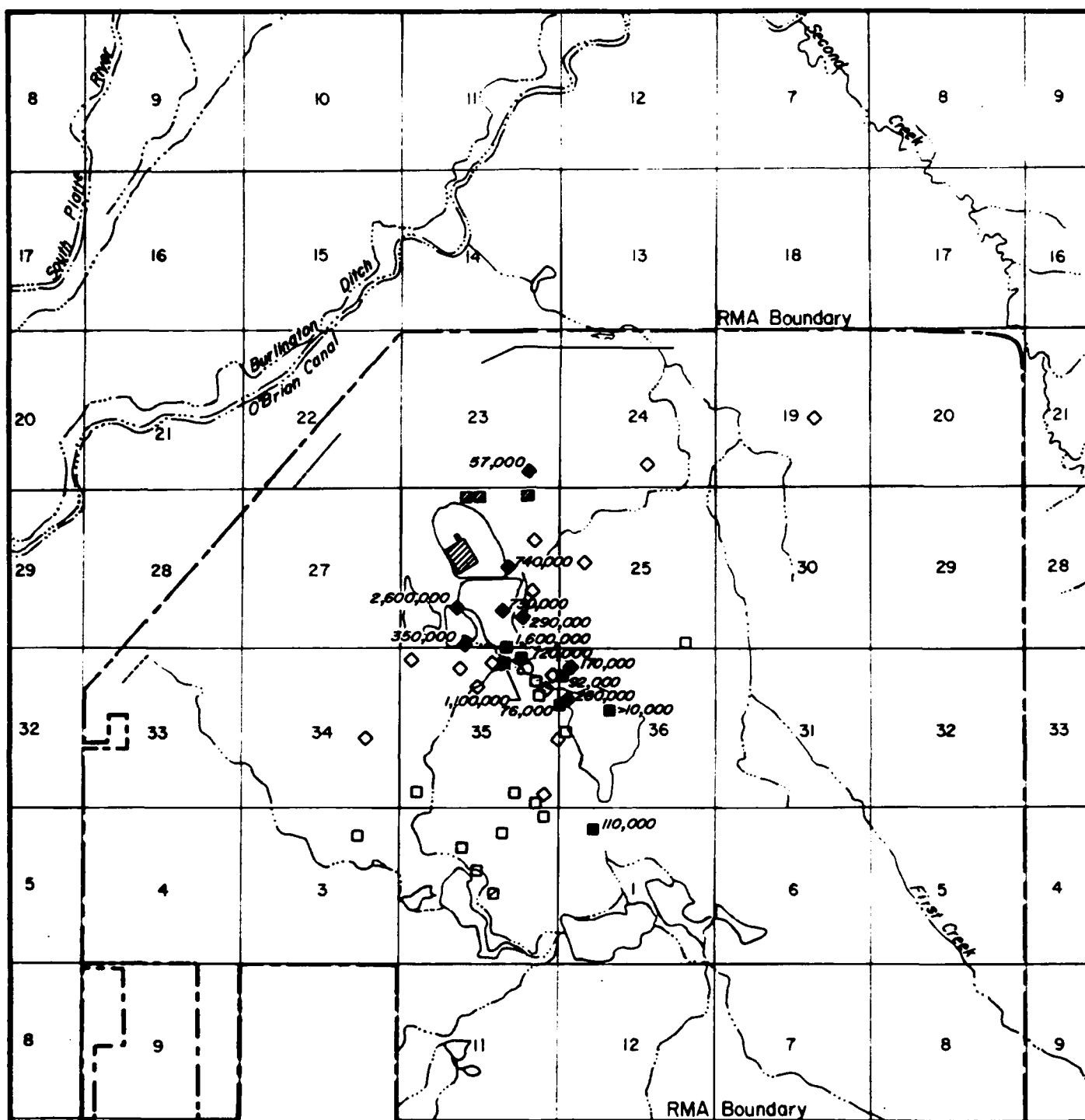
U.S. Army Program Manager for  
Rocky Mountain Arsenal  
Commerce City, Colorado

Prepared by:

R.L. Staller & Associates, Inc.  
Harding Lawson Associates

Figure A-65

Chloride Detections  
Denver Zones B & A  
Fall 1988  
CMP GWAR FY89



### Explanation

- 75,000 Denver Zone 1U Well Location
- 290,000 Denver Zone 1 Well Location
- ▨ Basin F IRA Structure
- Containment System
- Physical Barrier
- Hydraulic Barrier

Analyte Concentration in µg/l

Note : Open symbol  
Indicates analyte was  
not detected

0 5000 10,000 Feet  
0 1000 2000 3000 Meters

Prepared for :

U.S. Army Program Manager for  
Rocky Mountain Arsenal  
Commerce City, Colorado

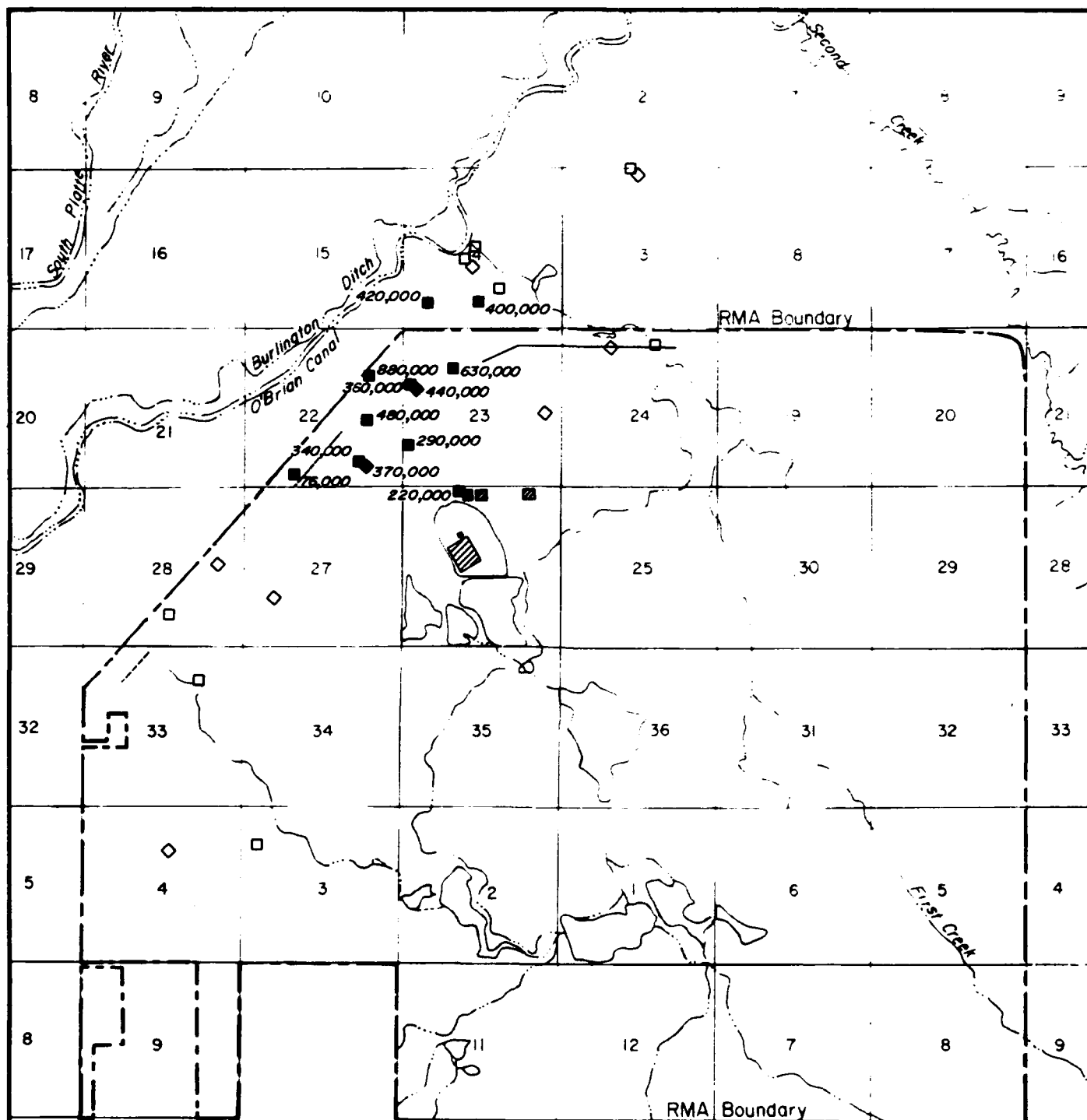
Prepared by :

R.L. Stollar & Associates, Inc.  
Harding Lawson Associates

Figure A-56

Chloride Detections  
Denver Zones 1U & 1  
Fall 1988  
CMP GVAR FY89





### Explanation

- 400,000 Denver Zone 4 Well Location
- ◆ 370,000 Denver Zone 5 Well Location
- ▨ Basin F IRA Structure

— Containment System  
 - - - Physical Barrier  
 ····· Hydraulic Barrier

Analyte Concentration in  $\mu\text{g/l}$

Note: Open symbol  
 indicates analyte  
 was not detected

0 5000 10,000 Feet  
 0 1000 2000 3000 Meters

Prepared for:

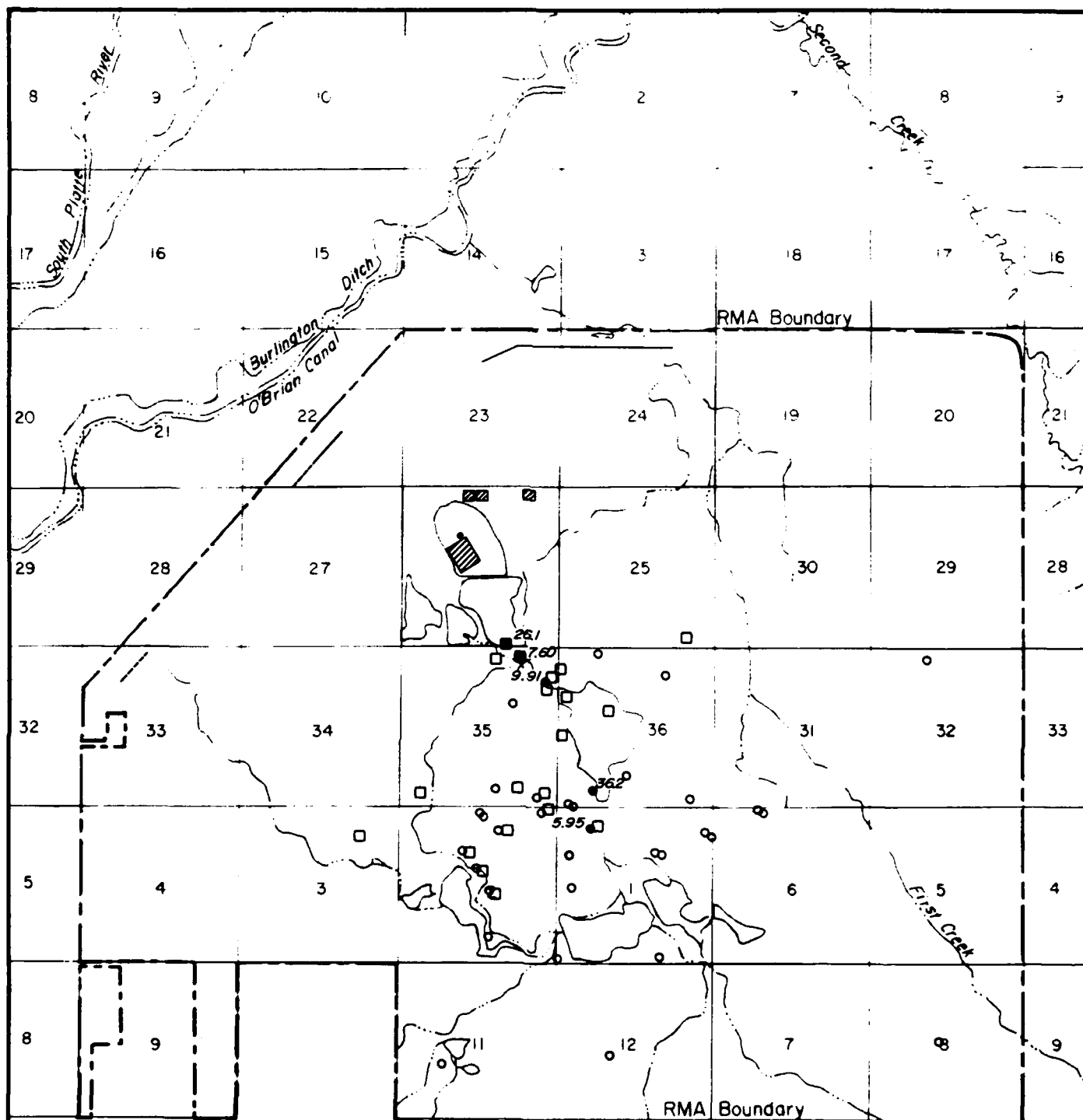
U.S. Army Program Manager for  
 Rocky Mountain Arsenal  
 Commerce City, Colorado

Prepared by:

R.L. Stollar & Associates, Inc.  
 Harding Lawson Associates

Figure A-58

Chloride Detections  
 Denver Zones 4 & 5  
 Fall 1988  
 CMP GVAR FY89



### Explanation

- 9.91 Denver Zone A Well Location
- 26.1 Denver Zone 1U Well Location
- ▣ Basin F IRA Structure

— Containment System  
 — Physical Barrier  
 — Hydraulic Barrier

Analyte Concentration in  $\mu\text{g/l}$

Note : Open symbol  
Indicates analyte  
was not detected

0 5000 10,000 Feet  
0 1000 2000 3000 Meters

Prepared for :

U.S. Army Program Manager for  
Rocky Mountain Arsenal  
Commerce City, Colorado

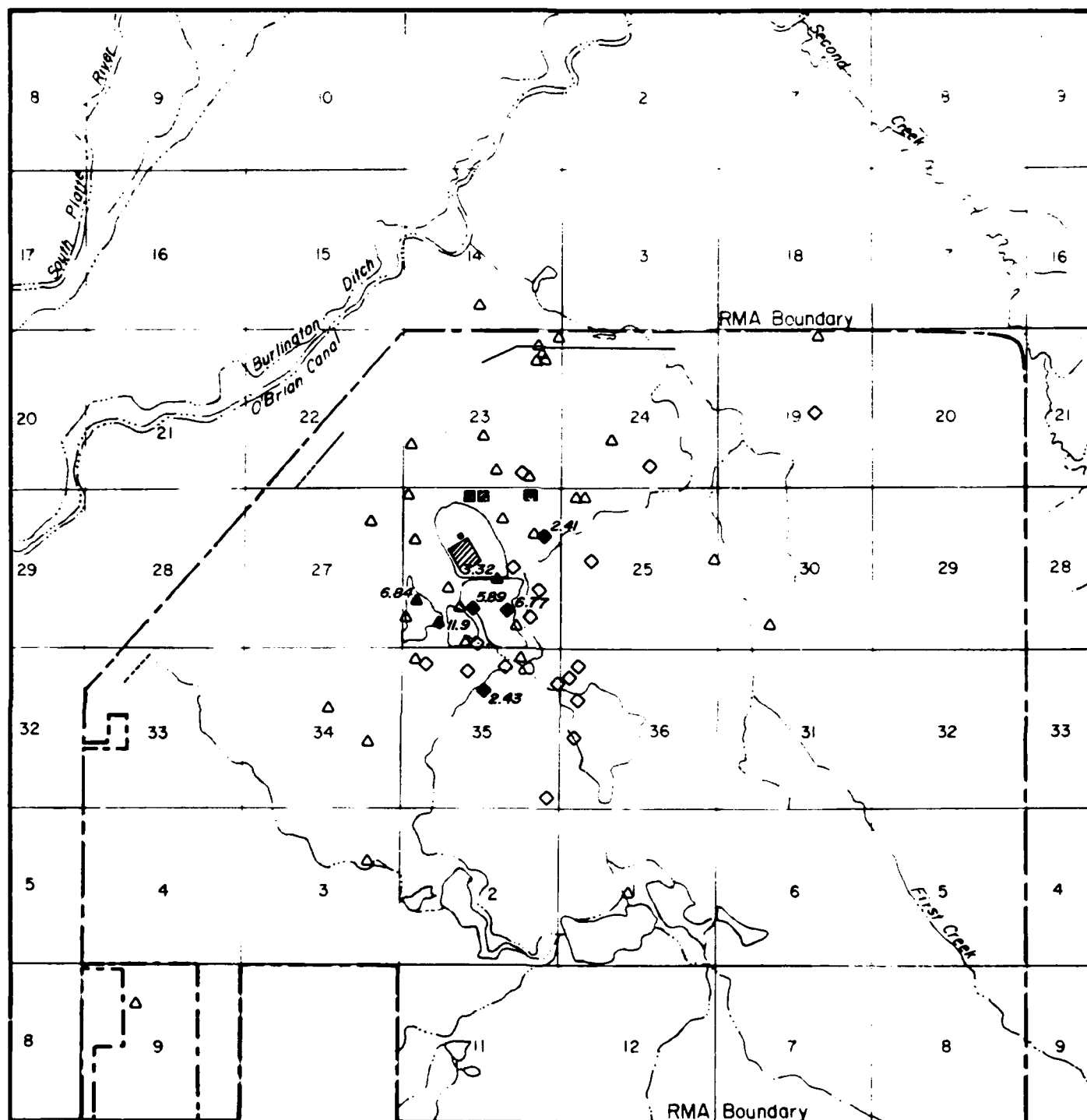
Prepared by :

R.L. Stoller & Associates, Inc.  
Harding Lawson Associates

Figure A-59

Arsenic Detections  
 Denver Zones A & 1U  
 Fall 1988  
 CMP GWAR FY89





### Explanation

- ◆ 2.41 Denver Zone 1 Well Location
- ▲ 3.31 Denver Zone 2 Well Location

- Containment System
- Physical Barrier
- Hydraulic Barrier

- ▣ Basin F IRA Structure

Analyte Concentration in  $\mu\text{g/l}$

Note: Open symbol  
Indicates analyte  
was not detected



0 5000 10,000 Feet  
0 1000 2000 3000 Meters

Prepared for:

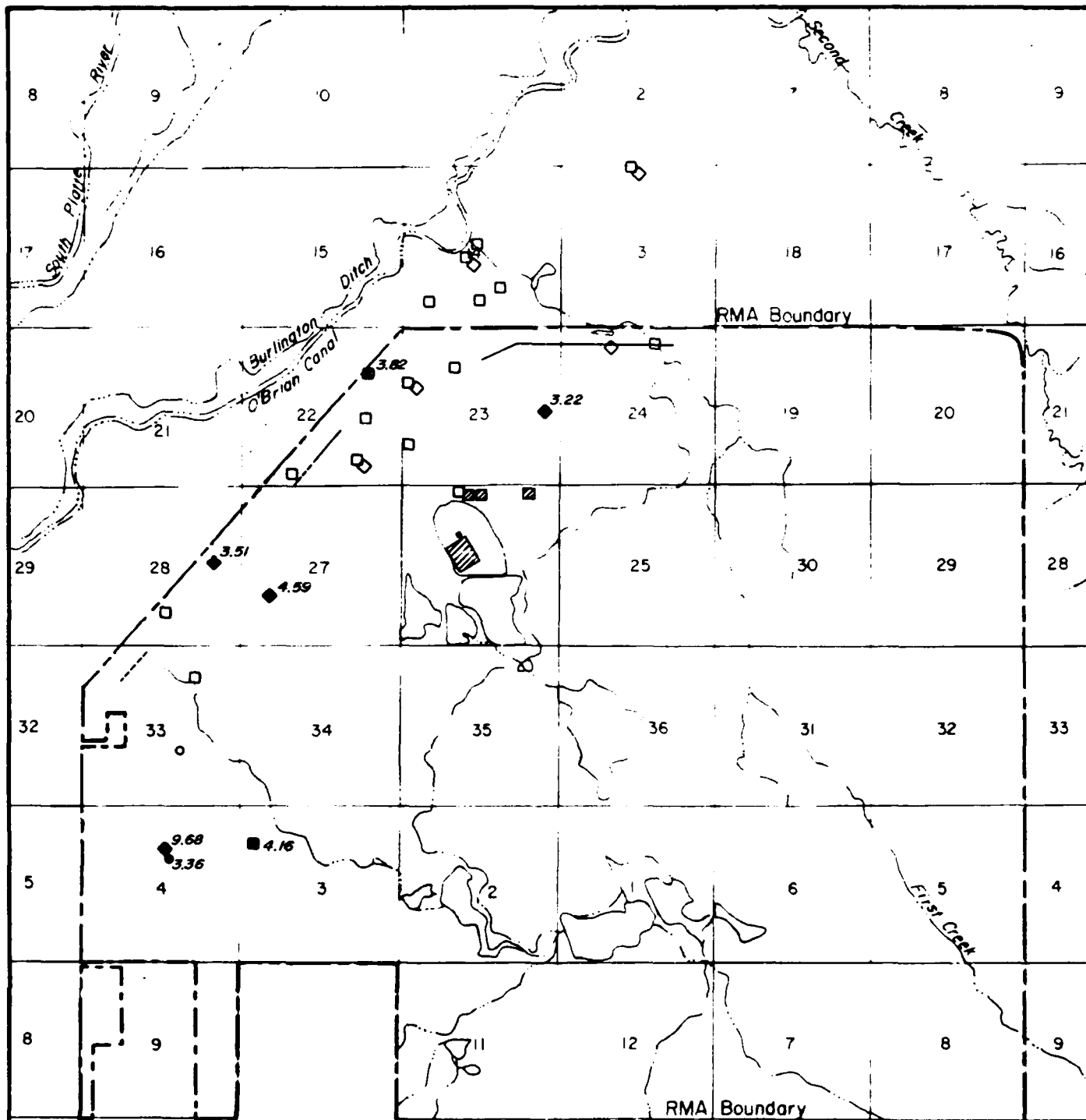
U.S. Army Program Manager for  
Rocky Mountain Arsenal  
Commerce City, Colorado

Prepared by:

R.L. Stollar & Associates, Inc.  
Harding Lawson Associates

Figure A-60

Arsenic Detections  
Denver Zones 1 & 2  
Fall 1988  
CMP GVAR FY89



### Explanation

- 3.62 Denver Zone 4 Well Location
- ◆ 3.22 Denver Zone 5 Well Location
- 3.36 Denver Zone 6 Well Location
- ▨ Basin F IRA Structure

Note: Open symbol  
Indicates  
analyte was not  
detected

- Containment System
- Physical Barrier
- Hydraulic Barrier

Analyte Concentration  
in µg/l

0 5000 10,000 Feet  
0 1000 2000 3000 Meters

Prepared for:

U.S. Army Program Manager for  
Rocky Mountain Arsenal  
Commerce City, Colorado

Prepared by:

R.L. Stollar & Associates, Inc.  
Harding Lawson Associates

Figure A-61

**Arsenic Detections  
Denver Zones 4, 5, & 6  
Fall 1988  
CMP GVAR FY89**

**APPENDICES B AND C**

**APPENDIX B: HYDROLOGIC DATA COLLECTED DURING FY89**  
(on diskette - enclosed)

**APPENDIX C: ANALYTICAL DATA COLLECTED DURING FY89**  
(on diskette - enclosed)

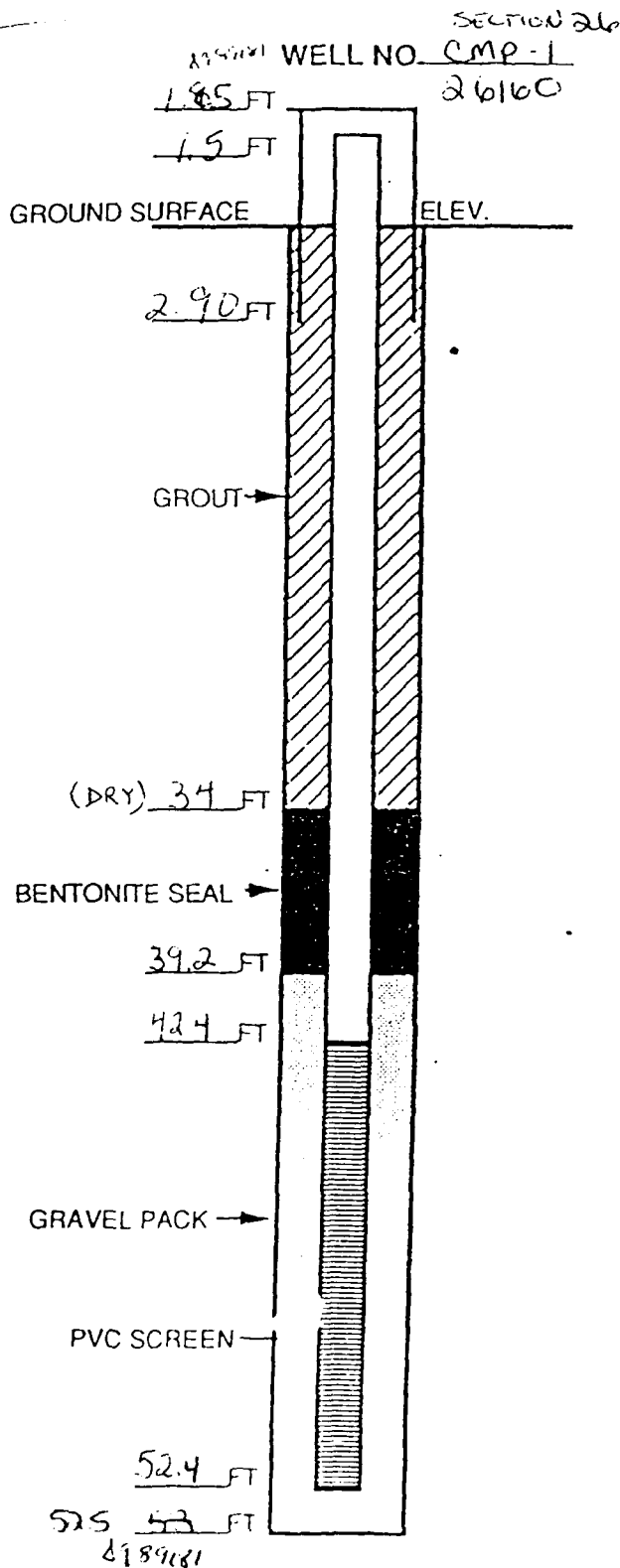
**APPENDIX D**

**GEOLOGIC/WELL CONSTRUCTION LOGS FOR WELLS INSTALLED**

**DURING FY89**

# WELL CONSTRUCTION LOG

46.4  
1.5  
47.1



Measuring point is ground surface unless otherwise noted

## DRILLING SUMMARY

Total Depth of Hole: 525' 49 1/2"  
Hole Diameter: 9 3/4"  
Drilling Company: LAYNE WESTERN  
Driller: RON MUCKEY  
Rig Type: CME 55  
Bits: CME & CARBIDE  
Geologist: SUSAN GOLDBERG

## CONSTRUCTION TIME LOG

	Start		Finish	
	Date	Time	Date	Time
Drilling:	89179	0835	89181	0640
Screen Placement:	89181	0710	89181	0820
Filter Placement:	89181	0825	89181	1030
Seal Placement:	89181	1042	89181	1105
Grouting:	89181	1310	89181	1500

## DEPTH TO WATER

Depth: 746' Date: 89181 Time: 1235

## WELL CONSTRUCTION MATERIALS

	Grout	Seals	Filter
Quantity	<u>145</u>	<u>3 1/2</u>	<u>6.25 BAGS (100 lb)</u>
Type	<u>102 PORTLAND CEMENT</u>	<u>3 BUCKETS (150 lb)</u>	<u>6.25 BAGS (100 lb)</u>
Screen	<u>102 PORTLAND CEMENT</u>	<u>3 BUCKETS (150 lb)</u>	<u>6.25 BAGS (100 lb)</u>
Size	<u>102 PORTLAND CEMENT</u>	<u>3 BUCKETS (150 lb)</u>	<u>6.25 BAGS (100 lb)</u>
Config:	<u>102 PORTLAND CEMENT</u>	<u>3 BUCKETS (150 lb)</u>	<u>6.25 BAGS (100 lb)</u>
Comp:	<u>102 PORTLAND CEMENT</u>	<u>3 BUCKETS (150 lb)</u>	<u>6.25 BAGS (100 lb)</u>
Inside Diam:	<u>4"</u>	<u>4"</u>	<u>4"</u>
Outside Diam:	<u>4"</u>	<u>4"</u>	<u>4"</u>

## COMMENTS

WELL 5' AT BOTTOM OF HOLE

R. L. STOLLAR & ASSOCIATES, INC

# FIELD LOG

PAGE 1 OF 2

[illegible]

FIELD LOG

DLA 90001

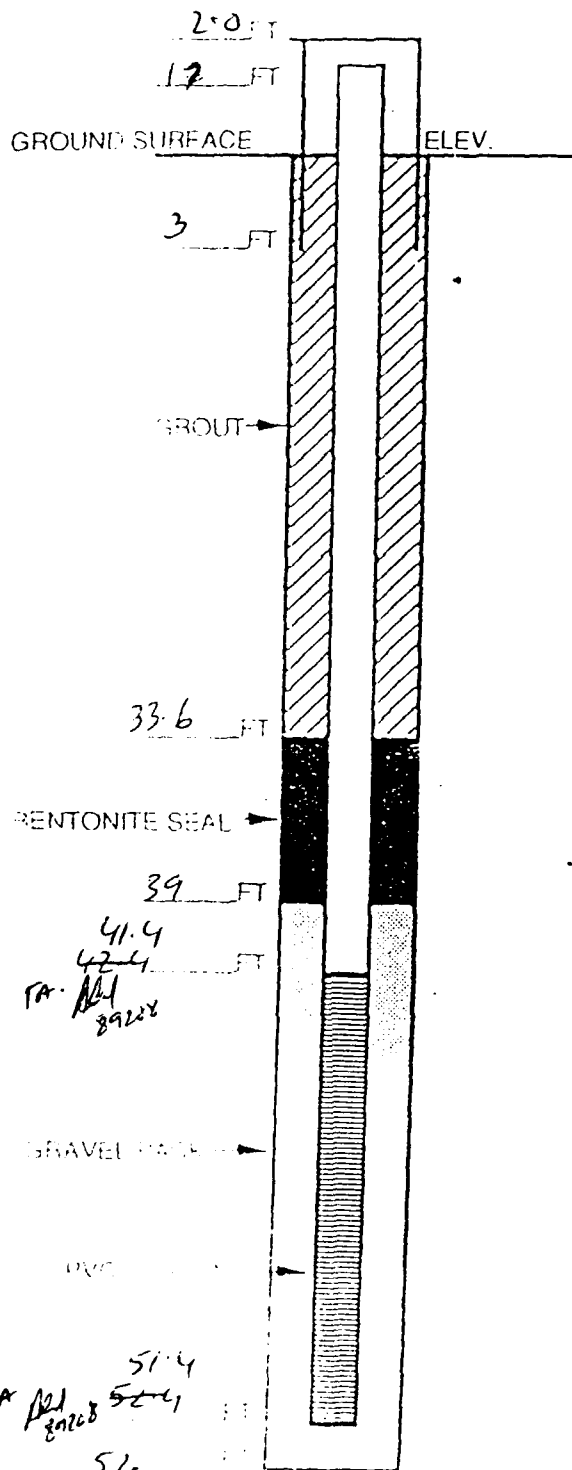
PAGE 1 OF 2

SITE ID: 26160

DEPTH (ft)	GRAPHIC LOG	WELL CONSTRUCTION	SAMPLE INTERVAL	RECOVERY (cm/cm)	DESCRIPTION (COLOR, TEXTURE, STRUCTURE)	ESTIMATED % OF					USCS ABBREV	MOISTURE	CONSISTENCY	COLOR	SAMPLE NUMBER
						GRAVEL	SAND			SILT					
							COSE	MED	FINE						
15				100/152	GRAVEL W/ COARSE SAND 1" - MAXIMUM GRAVEL SIZE SLIGHTLY BETTER SORTING LM - DRY AT BOTTOM. GRANULIC FRAGMENTS & FRAGMENTS ARE SUBORDINATE										6
30				132/152	GRAVEL AS ABOVE T 30-33' SILT SANDY CLAY W/ IRON STAINING 33-35 COARSE - MED SAND MOD - POORLY SORTED, SOME MIXED W/ GRAVEL (GRANITIC) LOOSE	0	0	0	100	0	MHLM		2.54 6.2 LIGHT BROWNISH GRAY		7
35				87/152	35-39 S-S - SAME AS 33-35 39.5-40 COARSE SAND (LESS COARSE THAN 33-39.5) 10-15% LOOSE COARSE GRAINS ARE GRANITE OF VARYING SIZES	0	70	30	0	0	SW DRY		2.54 6.2 LIGHT BROWNISH GRAY		8
40				75/152	MED COARSE SAND GRADES DOWN TO COARSE SAND Med MOIST - MOIST, LOOSE 0.00 AT TOP OF CORE BOTTOM CORE HAS PEBBLES UP TO 1" - .5 - 1.00	0	10	90	0	0	SP		2.54 5.16 LIGHT OLIVE BROWN		9
				110/152	VERY COARSE SAND LOOSE, POORLY SORTED WET SAME AS 40-45 SHARP SEPARATION BETWEEN LAYERS FINE GRAINED, V. WELL SORTED SAND WET	50	40	10	0	0	SW WET		SOFT VARIABLE		
				46	50-53 SAME AS 46-50 SATURATED								10YR 5.1		10

# WELL CONSTRUCTION LOG

WELL NO. 26161



## DRILLING SUMMARY

Total Depth of Hole: 52'  
 Hole Diameter: 10" Reamed  
 Drilling Company: Dayne Western  
 Driller: Larry King  
 Rig Type: CME-75  
 Bits: 3 3/4" Pilot 10" Ream  
 Geologist: Tony Shind

## CONSTRUCTION TIME LOG

	Start		Finish	
	Date	Time	Date	Time
Ream	89186	1259	89186	0710
Drilling:	89186	0826	89186	1020
Screen Placement:	89186	0715	89186	0735
Filter Placement:	89186	0735	89186	0815
Seal Placement:	89186	0821	89186	0901
Grouting:	89186	1216	89186	1240

## DEPTH TO WATER

Depth: 46 BGL Date: 89186 Time: 0952

## WELL CONSTRUCTION MATERIALS

#94 Grout  
 Quantity: 7 bags Cem/Bent  
 Type: Low Alkali Portland  
 Screen  
 Size: 4" I.D. Config: 10 slot flush Threaded  
 Area: \_\_\_\_\_ Comp: Schedule 40 PVC  
 Inside Diam 4" I.D. Outside Diam.: 4.5"

## COMMENTS

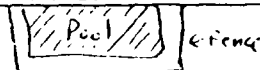
\_\_\_\_\_  
 \_\_\_\_\_  
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 \_\_\_\_\_

EBASCO SERVICES INCORPORATED



## FIELD LOG

PAGE 1 OF 2

LOCATION SKETCH  
OR DESCRIPTION

PROJECT NAME <i>DATA Camp Basin F. Drilling</i>		SITE TYPE <i>well</i>		SITE ID <i>26161 (CMP-2)</i>		NO OF SAMPLES <i>11</i>	
DRILLING COMPANY <i>Layne Western</i>		DRILLER <i>Larry King</i>		DATE/TIME STARTED <i>8/1/86 1 0826</i>		DATE/TIME COMPLETED <i>8/1/86 1 1020</i>	
DRILLING EQUIPMENT: METHOD <i>CME-75 - 1 1/2" hollow stem</i>		TOTAL DEPTH <i>52 ft</i>		INIT. WATER LEVEL <i>64 ft</i>		24 HR WATER LEVEL <i>?</i>	
SIZE AND TYPE OF BIT <i>5 3/4" Pilot; 10" Ream</i>		SAMPLING METHOD <i>split spoon</i>		GEOLOGIST (signature/date) <i>TARIG Ahmad</i>		CHECKED BY/DATE	

DEPTH (ft)	GRAPHIC LOG	WELL CONSTRUCTION	SAMPLE INTERVAL	RECOVERY (cm/cm)	DESCRIPTION (COLOR, TEXTURE, STRUCTURE)	ESTIMATED % OF					USCS ABBREV	MOISTURE	CONSISTENCY	COLOR	SAMPLE NUMBER	
						GRAVEL	SAND			SILT						
							COARSE	MED	FINE							
0					0-1': clayey silt. Coarsening towards the bottom end. Organic material	-	-	-	30	40	50	ML	mm	MHR	10YR 2/2	1
122				152	1'-4': silt with very fine sand. some clay. lighter colour. and coarser.	-	-	-	25	70	5	ML	D	MHR	10YR 5/3	
5					4'-7.8': Silty Sand							SM	D	MHR	10YR 5/4	
152				152	7.8-9.0': Silty clay	-	-	-	15	70	15	CL	mo	MHR	10YR 7/3	2
10					9-12.5': Silty Sand							CL	m	MHR	10YR 7/3	
152				152	12.5-14': Clay silt intermixed with calcareous? clays	0	-	-	2	8	90				10YR 8/1	3
15					clays - - - - - clayey silts - - - - -	5	-	-	15	75	15				10YR 5/4	
152				152	14-16': Silty Sand. Some gravel							SM				
20					16-18.5': Silty clay							CL				
152				152	18.5-19': Silty Sand	15	50	20	10	5	5	SM			10YR 5/6	4
20					19-22.5': Missing											
25				46	22.5-24': Gravelly Sand. Poorly sorted. well graded. 1 1/4" gravels max. Pink granitic and Feldspathic rock fragments. angular to subangular sand.	15	50	20	10	5	5	SW			10YR 5/6	5

## FIELD LOG

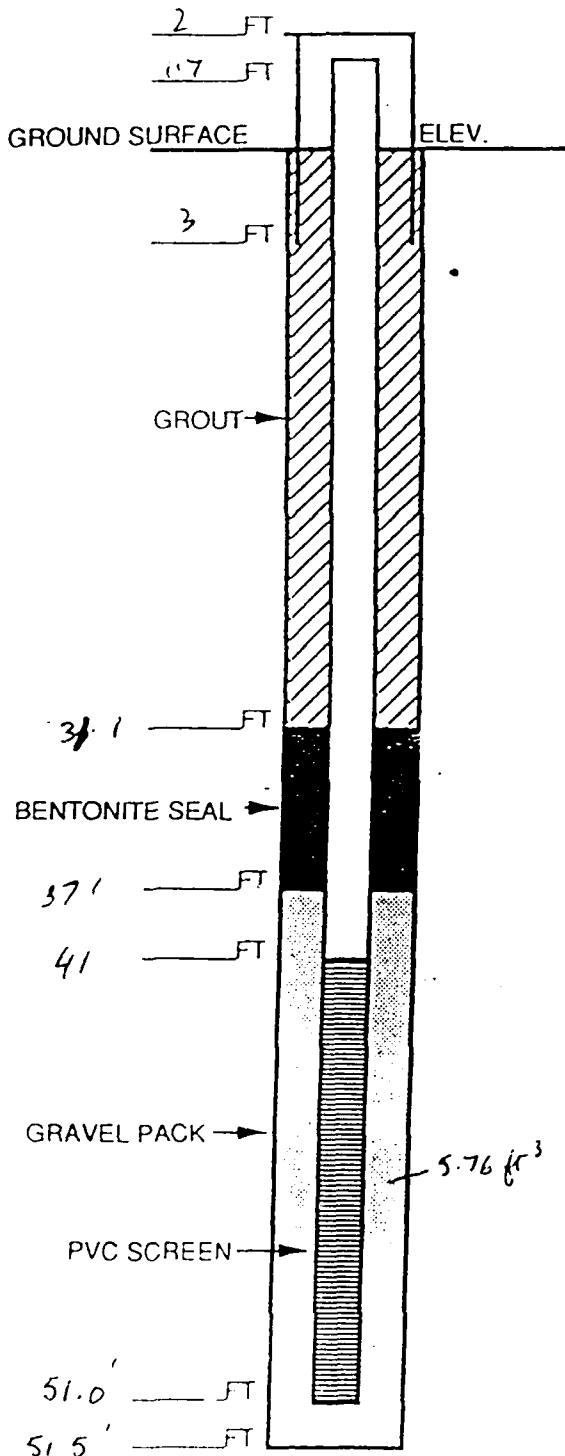
PAGE 2 OF 2

SITE ID: 2616j

DEPTH (ft)	GRAPHIC LOG	WELL CONSTRUCTION	SAMPLE INTERVAL	RECOVERY (cm/cm)	DESCRIPTION (COLOR, TEXTURE, STRUCTURE)	ESTIMATED % OF					USCS ABBREV	MOISTURE	CONSISTENCY	COLOR	SAMPLE NUMBER
						GRAVEL	SAND			SILT/CL					
							COARSE	MED	FINE						
1'	LC				24 - 26.5' Missing										
31	SAND		76 152		26.5 - 29': Well sorted to medium sorted sand. Mostly poorly graded. Sand 1.5 - 2φ. Angular to subangular R. Fragments and sand	2	-	90	8	-	SP	mm		10YR 6/4	6
31	SAND		76 152		29 - 31.5': Missing 31.5 - 33.5': Well graded sand angular to subangular. Some gravel 33.5 - 34': Clay with some gravel	15	50	20	10 5 10	5 10	SW	m		10YR 5/6	7
36	SAND		76 152		34 - 36.5': Missing 36.5 - 39': Well graded sand angular to subangular. Some gravel	5	-	-	5	80 10	CH	m		10YR 5/6	8
41	SAND		76 152		39 - 42': Missing 42 - 44': Well graded sand with some gravel angular to subangular consistency towards bottom	15	50	20	10	5 0	SW	m		10YR 5/6	9
46	SAND		61 152		44 - 50.3': Missing 50.3 - 52': Siltstone - Denver Formation - fine gr	15	50	20	10	5 0	SW	m		10YR 5/6	10
51	SAND				VOID SPACE SANDRE TO SHOULD BE HERE										
56	SAND		106 152		44 - 45.5' Coarse gravel. rounded to subangular. well graded some fine and medium sand. mafic and felsic pathic rocks. 45.5 - 49': Siltstone. fine grained Bedrock. Fractured. rusty discoloration	80	10	5	5	-	GP	m		10YR 5/4 10YR 5/1	10
			52 152		49 - 50.3' Missing 50.3 - 52': Siltstone fine grained fine fractures - rusty discoloration along fractures									W 10YR 5/1	11

# WELL CONSTRUCTION LOG

WELL NO. 26162



Measuring point is ground surface unless otherwise noted

## DRILLING SUMMARY

Total Depth of Hole: 51.5' BGL  
 Hole Diameter: 10" (Reamed)  
 Drilling Company: Layne Western  
 Driller: Larry King / Helper Alton Shoemaker  
 Rig Type: EME-75  
 Bits: 3 3/4' for Pilot - 10' for Ream  
 HydroGeologist: Tarig Ahmad

## CONSTRUCTION TIME LOG

	Start		Finish	
	Date	Time	Date	Time
Pilot Reaming	8/9/91	1153	8/9/91	0751
Drilling	8/9/91	0643	8/9/91	0840
Screen Placement	8/9/92	0839	8/9/92	0857
Filter Placement	8/9/92	0850	8/9/92	0907
Seal Placement	8/9/92	0910	8/9/92	0925
Grouting	8/9/92	1338	8/9/92	1420

## DEPTH TO WATER

Dry hole. (As to date)  
 Depth: \_\_\_\_\_ Date: \_\_\_\_\_ Time: \_\_\_\_\_

## WELL CONSTRUCTION MATERIALS

	Grout	Seals	Filter
Quantity:	752 lbs/cm / 57.60' Ben.		
Type:	182 low alkali Portland Cement Screen	1/4" Tabbed Vd clay bentonite	10/20 sand by Colorado Silver
Size:	4" O.D.	Config: Flush Threaded	
Area/Ft.:		Comp: 40 PVC / 10 Slot	
Inside Diam.:		Outside Diam.:	

## COMMENTS


Because of potential of leachate migration basically to top of Denver, a deeper hole to the improved aquifer was not drilled in future. This will satisfy the proper authorities that no leachate is leaching from the point to the water table.

\* cm/Bentonite Ratio for Grout = 20:1

EBASCO SERVICES INCORPORATED

Belting (1)

LOCATION SKETCH  
OR DESCRIPTION

LOCATION SKETCH OR DESCRIPTION	
	

PROJECT NAME RMA - CAMP - Drilling				SITE TYPE well		SITE ID 2662		NO OF SAMPLES 5							
DRILLING COMPANY Jorge Weston			DRILLER Larry King		DATE/TIME STARTED 8/19/1 0643		DATE/TIME COMPLETED 8/19/1 0850								
DRILLING EQUIPMENT : METHOD				TOTAL DEPTH		INIT. WATER LEVEL		24 HR WATER LEVEL							
				ft	cm	ft	cm	ft	cm						
SIZE AND TYPE OF BIT 3 1/2 in Pilot			SAMPLING METHOD Cone Barrel		GEOLOGIST (signature/date) Tony Mund		CHECKED BY/DATE								
DEPTH (ft)	GRAPHIC LOG	WELL CONSTRUCTION	SAMPLE INTERVAL	RECOVERY (cm/cm)	DESCRIPTION (COLOR, TEXTURE, STRUCTURE)	ESTIMATED % OF				USCS ABBREV	MOISTURE	CONSISTENCY	COLOR	SAMPLE NUMBER	
						GRAVEL	SAND	SILT							
						GRAVEL	SAND	SILT	CLAY						
0				12/19/12	0-4' - silty clay, salt	0	0	0	100	ML	11	8	10YR 6/8		
5				11/2	4-8' - silty clay	0	0	0	100	ML	11	8	10YR 6/8		
				15/2	8-12' - silty clay, with some colored micaceous. calcareous clay part	0	0	0	100	ML	11	8	10YR 6/8		
10				15/2	12-16' - clayey sand	0	0	0	100	ML	11	8	10YR 6/8		
15				15/2	16-21' - test core	0	0	0	100	ML	11	8	10YR 6/8		
20				15/2	21-24' - clayey sand with micaceous and silty sand transitions to well-sorted sand below	0	0	0	100	ML	11	8	10YR 6/8		
25				15/2	24-27' - test core	0	0	0	100	ML	11	8	10YR 6/8		
				15/2	27-34' - gravelly sand gravel rounded to subrounded, sand angular to subangular	40	60	20	20	ML	11	8	10YR 6/8		

\*<sup>1</sup> must be controlled against: suggests to management, think of a good one, and proceed. Since (s. 12) allows for more constitution

## FIELD LOG

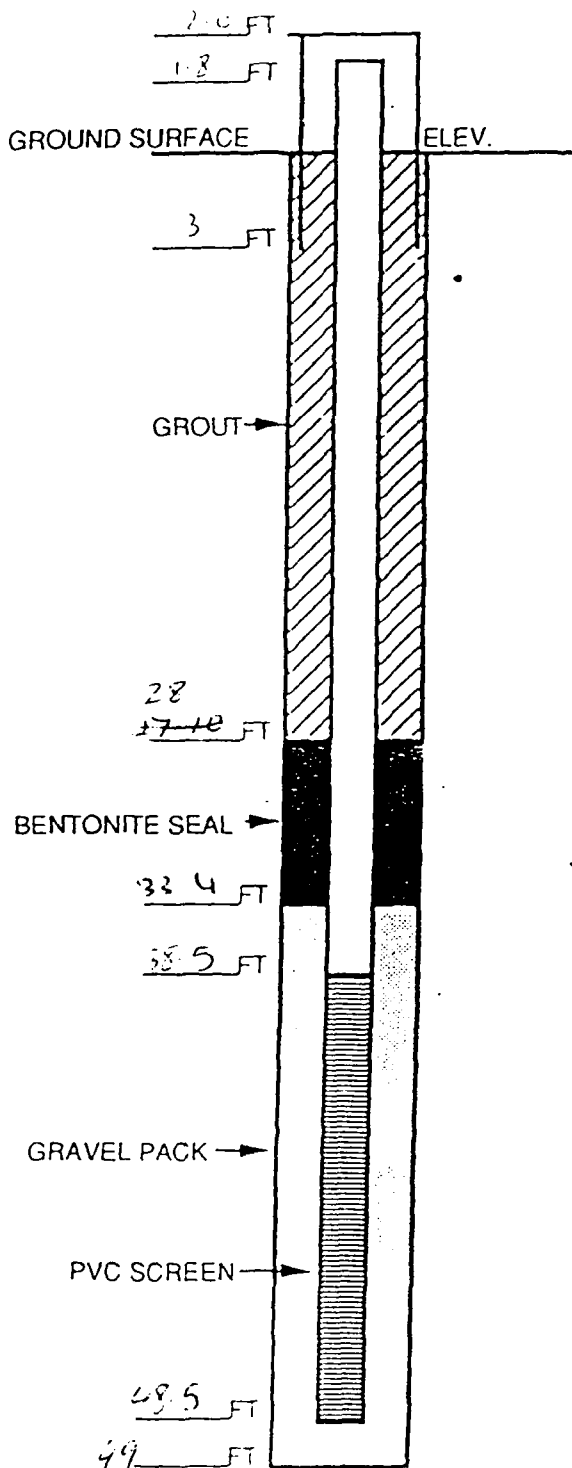
PAGE 2 OF 2

SITE ID: 76162

[illegible]

# WELL CONSTRUCTION LOG

WELL NO. 26163



Measuring point is ground surface unless otherwise noted

## DRILLING SUMMARY

Total Depth of Hole: 49.1  
 Hole Diameter: 10' outer / 4" Casing  
 Drilling Company: Layne Western  
 Driller: Larry King / Helper Alton Stender  
 Rig Type: CME-75  
 Bits: 2 1/2" Pilot 6 1/4" 15' 10" 12" 10"  
 Hydr Geologist: Tarek Ahmad (MCA)

## CONSTRUCTION TIME LOG

	Start		Finish	
	Date	Time	Date	Time
Leaming	8/19/93	0241	8/19/93	0938
Drilling:	8/19/93	0637	8/19/93	0745
Screen Placement:	8/19/93	1036	8/19/93	1043
Filter Placement:	8/19/93	1044	8/19/93	1114
Seal Placement:	8/19/93	1116	8/19/93	1123
Grouting:	8/19/93	1220	8/19/93	1345

## DEPTH TO WATER

Depth: 41.4 Date: 8/19/93 Time: 0725

Demer was dry sand layer on top of water

## WELL CONSTRUCTION MATERIALS

	Grout	Seals	Filter
Can #4 5 bag		3 Bags = 150 lbs	611 lbs
Quantity:			
Bag 25 lbs			
Type:		2 tablet	10-20 Sand
low water / Portland Cement			
	Screen		
Size:	10'	Config:	10' slot
Area/Ft:		Comp:	Schedule 40 MC
Inside Diam.:	4	Outside Diam.:	6.5

## COMMENTS

## FIELD LOG

PAGE 1 OF 2

PROJECT NAME				SITE TYPE	SITE ID		NO OF SAMPLES								
EMP Boring F Mauder wells				well (M)	26163		10								
DRILLING COMPANY			DRILLER	DATE/TIME STARTED		DATE/TIME COMPLETED									
Layne Western			Larry King	0637 1 89193		0745 1 89193									
DRILLING EQUIPMENT : METHOD				TOTAL DEPTH	INIT. WATER LEVEL		24 HR WATER LEVEL								
CME-75 / Hollow stem				49 ft cm	41.9 ft cm		7 ft cm								
SIZE AND TYPE OF BIT		SAMPLING METHOD		GEOLOGIST (signature/date)			CHECKED BY/DATE								
3 3/4 Pilot.		split spoon (5')		Tariq Ahmad											
DEPTH (ft)	GRAPHIC LOG	WELL CONSTRUCTION	SAMPLE INTERVAL	RECOVERY (cm/cm)	DESCRIPTION (COLOR, TEXTURE, STRUCTURE)	ESTIMATED % CF					USCS ABBREV	MOISTURE	CONSISTENCY	COLOR	SAMPLE NUMBER
						GRAVEL	SAND			SILT					
							CSE	MED	FINE						
0					0-4': clayey silt.	0	0	0	15	80	ML	11% moist	SR	10YR 6/4	21.5'
5				122 152	4-8.5' - clayey silt. < 3.5-3.0φ some sand (fine) seems more clay content. Transition to more silt content at lower end. 8.5-9' - clayey silt.				10	80 30	ML	MM	SR	10YR 4/3 (moist)	
10				152 152	9'-14' - clayey silt as at 4'-8.5'. more moisture				15	80 5	ML	MM	SR	10YR 7/6	8.9'
15				152 152	14-17.8' - clayey silt as at 9'-14'. same moisture				15	80 5	ML	MM	SR	10YR 7/6	
20				152 152	17.8 - 19' - Mediumly graded gravelly sand. rounded to subrounded gravel. Multiple rock types. Sand fraction angular to subangular.	15	30	40	15	0	SW	MM	SR	10YR 6/6	
25				10668 152	19-22.5' - same as at 17.8  22.5-24' lost core	15	30	40	15	0	SW	MM	SR	10YR 6/6	

## FIELD LOG

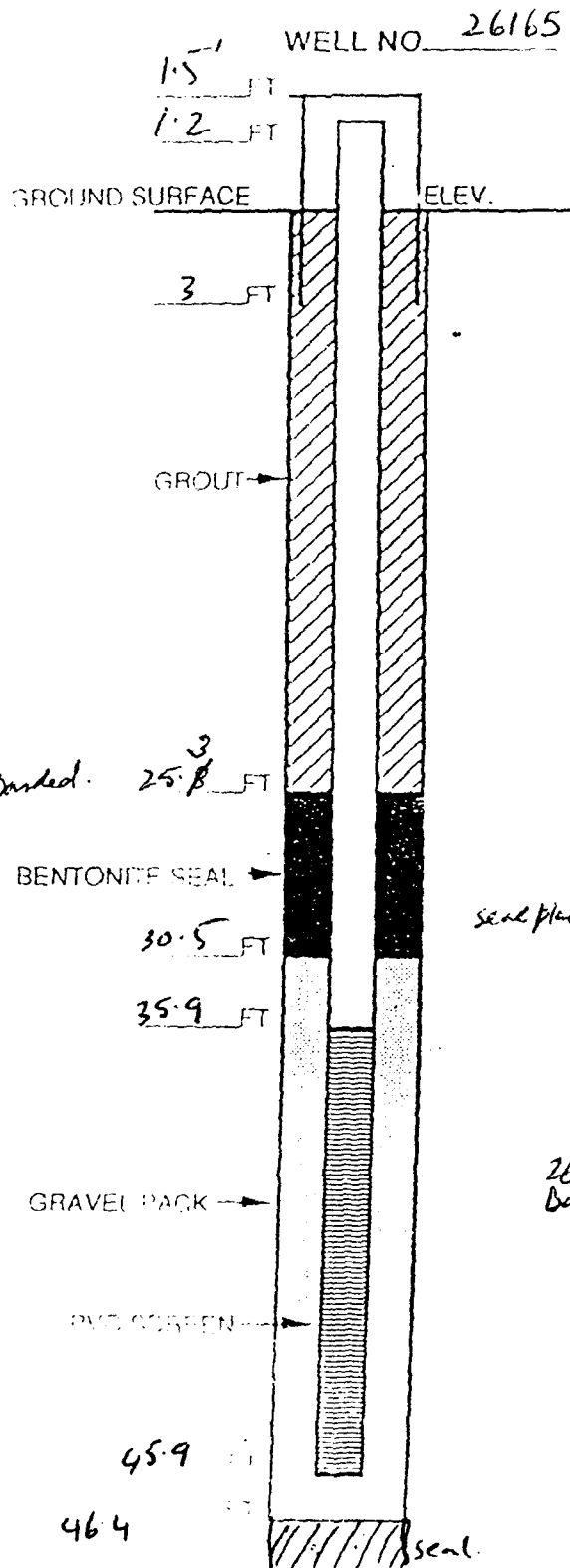
PAGE 2 OF 2

SITE ID: 26163

DEPTH (ft)	GRAPHIC LOG	WELL CONSTRUCTION	SAMPLE INTERVAL	RECOVERY (cm/cm)	DESCRIPTION (COLOR, TEXTURE, STRUCTURE)	ESTIMATED % OF					USCS ABBREV	MOISTURE	CONSISTENCY	COLOR	SAMPLE NUMBER
						GRAVEL	COARSE	MED	FINE	SI/CL					
25				85.4 152	24-26.8 - moderately graded sand with some gravel - rounded to sub- rounded gravel. sand fraction angular to subangular. (gravelly) 26.8 - 28 - lost core.	15	30	40	15	0	SW	m	SR	10YR 6/6	
32				137.6 152	29-33.5 - clayey silt with red/rusty laminations. set grayish 33.5 - 34 - lost core.	0	0	0	10	80	ML	m	SR	10YR 7/1	
35				146.76 152	34-34.2 - clayey silt as at 29. with good well marked contact with sand below 34.2 - 35.6 - well sorted fine to med graded sand. (silty) 35.6 - 37 - Moderately graded sand with some gravel - rounded to sub- rounded gravel. angular to subangular sand fraction gravelly 37-39 - lost core	0	0	50	50	0	SP	m	SR		
41				150.50 152	39-41.4 - same sand as at 35.6 gravel fraction remains same to naked eye 41.4-41.8 - same graded as above but with high organic content. mildly graded. gravelly sand 41.8-44 - lost core	15	30	40	15	0	SW	m	SR	10YR 6/6	
44				156 152	44-44.9 - gravelly sand as at 41.4; high organic content 44.9-49 - dense formation - hard sand	15	30	40	15	0	SW	m	SR	10YR 6/6	at 45



# WELL CONSTRUCTION LOG



## DRILLING SUMMARY

Total Depth of Hole: 54 original / sealed to

Hole Diameter: 10"

Drilling Company: Dayne Western

Driller: Larry King Alton Shoemaker

Rig Type: CME-75

Bits: 10" outer

Geologist: Tarig Ahmad

## CONSTRUCTION TIME LOG

	Start		Finish	
	Date	Time	Date	Time
Drilling:	8/19/94	0645	8/19/94	0753
Screen Placement:	8/19/94	0923	8/19/94	0930
Filter Placement:	8/19/94	0925	8/19/94	0958
Seal Placement:	8/19/94	1000	8/19/94	1004
Grouting:	8/19/94	1030	8/19/94	1045
Seal Placement	8/19/94	0800	8/19/94	0812

## DEPTH TO WATER

Depth 46.4 Date: 8/19/94 Time: 0930

## WELL CONSTRUCTION MATERIALS

	Grout	Seals	Filter
26 lbs	Quantity: <u>7 bps</u>	<u>3 buckets</u>	<u>7 bps</u>
Bentone	Type: <u>low alkali Portland Screen</u>	<u>1/4 Pellet</u>	<u>Silica 10/20</u>
Size	<u>4" 1.0 / 4.500</u>	Config: <u>10 slot (Factory)</u>	
Comp:	<u>Schedule 40 PVC</u>		
Outside Diam.:	<u>4.5"</u>		

## COMMENTS

Dry well.

Measuring point is ground surface unless  
otherwise noted.



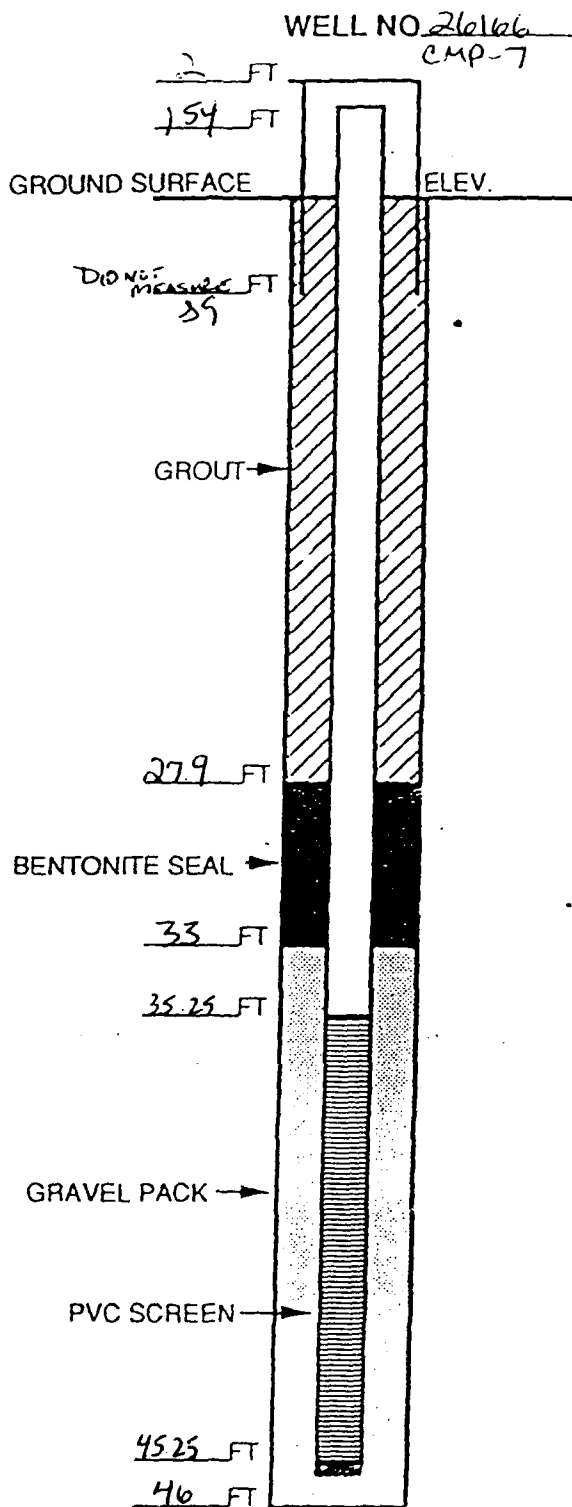
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SITE ID: CMF 6

DEPTH (11)	GRAPHIC LOG	WELL CONSTRUCTION	SAMPLE INTERVAL	RECOVERY (cm/cm)	DESCRIPTION (COLOR, TEXTURE, STRUCTURE)	ESTIMATED % OF					USCS ABBREV	MOISTURE	CONSISTENCY	COLOR	SAMPLE NUMBER	
						GRAVEL	SAND									SILT
							CO	MED	FINE	CL						

24			↑ 5' ↓	49/152	24-29.3' COARSER GRAVELS AND SAND MOD. SORTED SUBANGULAR QZ, PLAC, AMPH. MAY CONTAIN'S LARGE COBBLES 3-7 mm diameter LOST BOTTOM 3.7'	60	30	30	0	0	GP	VM	NE	7.5YR 6/4	SAME AS #5 except coarser
29			↑ 5' ↓	44/152	29-30.4 COARSE GRAVELS AND SAND SAME AS 24-29.3' except SUB BKN ROUNDED BOTTOM 3.6' SLID OUT	50	30	20			GP	VM	NE	7.5YR 5/6	SAME AS #5
41			↑ 9' ↓	24/152	34-36.4 ALTERNATING LAYERS SUBROUNDED OF SAND AND GRAVEL WELL SORTED MORE CLAY NEAR BOTTOM SUBANGULAR MOD. SORTED	70	25	5			GP	VM	NR	7.5YR 4/4	6
31			↑ 5' ↓	152/152	39-43.0' CLAY-SOME IRON STAINING 43.0-44.0' SAND AND GRAVELS (SAME AS ABOVE) SUB ROUNDED	50	30	15	5		SH	VM	NE	10YR 5/3 7.5YR 5/6	7
44			↑ 5' ↓	127/152	44-45.5' POORLY SORTED SAND & GRAVEL 45.5-48.0' DENVER CLAYSTONE FRIABLE FRACTURED W/ IRON STAINING LOST BOTTOM 1.0'	30	50	10	10		GW CM	VM	NR	7.5YR 5/4	8
49			↑ 5' ↓	154/152	49-52.3' SAME FRACTURED DENVER CLAYSTONE AS ABOVE MORE IRON STAINED LAYERS 1/8" THICK 52.3-54' BLACK CLAYSTONE FRACTURED FRIABLE						DL	EM	HR	10YR 2.5/1	9

# WELL CONSTRUCTION LOG



Measuring point is ground surface unless otherwise noted.

## DRILLING SUMMARY

Total Depth of Hole: 46'

Hole Diameter: 9.75"

Drilling Company: LAYNE WESTERN

Driller: RON MUCKEY

Rig Type: CMESS

Bits: 6 1/4" 10" 9 3/4" CD <sup>MUCB</sup> BIT: 10" REAMER/DRILLER

Geologist: SUSAN G. DORR  
Joan Golley

## CONSTRUCTION TIME LOG

	Start		Finish	
	Date	Time	Date	Time
Drilling:	8/9/94	1200	8/9/95	0938
Screen Placement:	8/9/95	0951	8/9/95	1000
Filter Placement:	8/9/95	1005	8/9/95	1116
Seal Placement:	8/9/95	1121	8/9/95	1209
Grouting:	8/9/95	1238	8/9/95	1332

## DEPTH TO WATER

Depth: 39.0 Date: 8/9/95 Time: 0559

## WELL CONSTRUCTION MATERIALS

	Grout	Seals	Filter
Quantity:	<u>12 BAGS</u>	<u>3 BAGS</u>	<u>5 (100 LB) BAGS</u>
Type:	<u>TYPE #2 LBS</u> <u>ALKALI RESISTANT</u>	<u>1" TABLETS</u> <u>VICRYL</u> <u>H. HENRIAD</u> <u>CLAY</u>	<u>SS 5.4UM 0/20</u>
Screen			
Size:	<u>0.1</u>	Config: <u>FLUSH JOINTED</u>	
Area/Ft.:		Comp: <u>PVC</u>	
Inside Diam.:	<u>4"</u>	Outside Diam.:	<u>4"</u>

## COMMENTS

WELL IS SCREENED TO AN ALLUVIAL (GRAVELLY SAND) LAYER. BEDROCK WAS NOT REACHED

## FIELD LOG

LOCATION SKETCH  
OR DESCRIPTION

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6412

## FIELD LOG

PAGE 1 OF 2

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## FIELD LOG

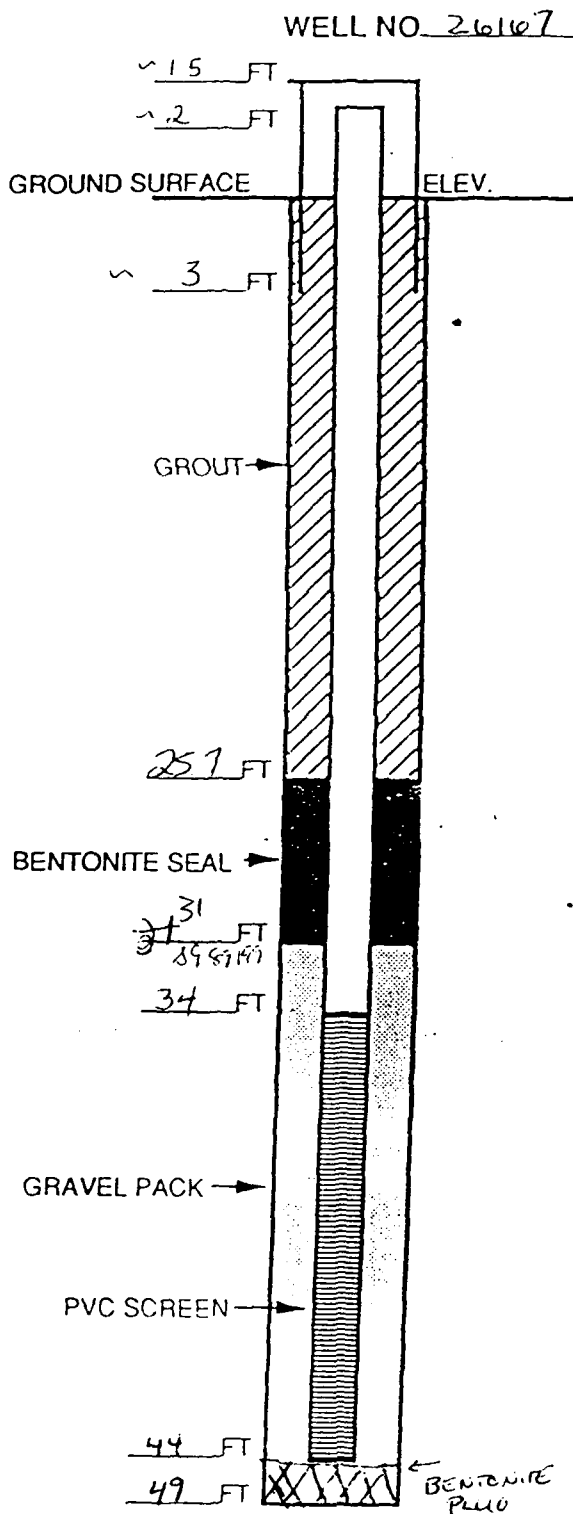
PAGE 2 OF 2

CMP-7

SITE ID: 26166

DEPTH (11)	GRAPHIC LOG	WELL CONSTRUCTION	SAMPLE INTERVAL	RECOVERY (cm/cm)	DESCRIPTION (COLOR, TEXTURE, STRUCTURE)	ESTIMATED % OF					USCS ABBREV	MOISTURE	CONSISTENCY	COLOR	SAMPLE NUMBER
						GRAVEL	SAND			SILT					
							CO	MED	FINE						
				25 15'	25-30' - JAME WITH SOME MOISTURE SLIGHTLY MORE GRAVEL	20	40	30	10	0	SW	10%	SOFT	VARIABLE	6
				32 15'	CLAYEY SAND 30-31' SAND WITH IRON OXIDE STAINING, MUSCOVITE FLAKES STIFF MED-MOIST - MOIST PLASTIC 31.5-35 VCL SAND 0.0-0.5% LOOSE NON CEMENTED SUBGRADED - SUBGRADED	0	0	0	50	10	SC	30%	10YR S/L GRAY		7
				35 3/5'	35-37.7 VCL SAND 0.0-0.5% LOOSE NON CEMENTED, SAME AS 30-31' WITH SOME STREAKS OF GREENISH CLAY 37.7-41.5 - VERY WET COARSE SAND FEW - 7% COATED IN CLAY - 4-3 ROUNDED - SUBANGULAR MOD - POORLY SORTED LOST BOTTOM OF CORE	0	0	0	0	0	SW	10%		VARIABLE	8
				41 1/1'	40-41 VCL SAND COATED WITH CLAY  LOST 41-42' FLOW USING CENTER BIT	0	0	0	0	0	SW	10%		VARIABLE	9
				42 35'	42-43' VERY FINE SILT CLAYEY SAND 3.5-3.8% SUBGRADED, WELL SORTED 43-45.5' COARSE SAND WHICH BECOMES COARSELY DEPT MOD. WELL SORTED SUBANGULAR	0	0	0	8	10	SL	10%	2.5Y S/L GRAY		10

# WELL CONSTRUCTION LOG



## DRILLING SUMMARY

Total Depth of Hole: 49' BENTONITE PLUG -> 44'  
 Hole Diameter: 9.75"  
 Drilling Company: LAYNE WESTERN  
 Driller: RON MUCKEY  
 Rig Type: CME 55  
 Bits: CME CARBIDE  
 Geologist: SUSAN GOLDBERG

## CONSTRUCTION TIME LOG

	Start		Finish	
	Date	Time	Date	Time
Drilling:	89198	0825	89199	0856
Screen Placement:	89199	1045	89199	1108
Filter Placement:	89199	1112	89199	1226
Seal Placement:	89199	1226	89199	1247
Grouting:	89199	1309	89199	1352

## DEPTH TO WATER

Depth: DRY Date: 89199 Time: 1351

## WELL CONSTRUCTION MATERIALS

	Grout	Seals	Filter
Quantity:	<u>12</u>	<u>3.5 BUCKETS</u>	<u>6.5 BALLS</u> 100 lb
Type:	<u>PORTLAND</u>	<u>AMERICAN CONCRETE READY TO SET</u>	<u>CSST SIMON</u>
Size:	<u>89/8/199</u>	<u>4 BUCKETS FOR BOTTOM SEAL</u>	<u>10/20</u>
Area/Ft.:			
Inside Diam.:	<u>4"</u>		
Outside Diam.:		<u>4"</u>	
Config:		<u>HORIZONTAL SLOT</u>	
Comp:		<u>PVC</u>	<u>1</u>

## COMMENTS

HERE WAS BEAMED TO 49'  
AND PLUGGED W/ BENTONITE FROM 44-49'  
CASING WAS SET TO TOP OF PLUG

R. L. STOWAR  
 EBAECO SERVICES INCORPORATED  
 512-

LOCATION SKETCH  
OR DESCRIPTION

20' I  
CAMP (T)  
SS

WASIE  
PILE

SECTION 26

PAGE 1 OF 2

PROJECT NAME				SITE TYPE		SITE ID		NO OF SAMPLES							
DRILLING COMPANY				DRILLER		DATE/TIME STARTED		DATE/TIME COMPLETED							
DRILLING EQUIPMENT : METHOD				TOTAL DEPTH		INIT. WATER LEVEL		24 HR WATER LEVEL							
SIZE AND TYPE OF BIT				SAMPLING METHOD		GEOLOGIST (signature/date)		CHECKED BY/DATE							
CAMP BASIN				WELL		26167		9							
LAYNE WESTERN				ROY MUCKEY		5/9/98 10525		1							
CME 55: HOLLOW STEM AUGER				SPLIT SPOND		Susan G. Galtley 1/8/98									
DEPTH (ft)	GRAPHIC LOG	WELL CONSTRUCTION	SAMPLE INTERVAL	RECOVERY (%)	DESCRIPTION (COLOR, TEXTURE, STRUCTURE)	ESTIMATED % OF					USCS ABBREV	MOISTURE	CONSISTENCY	COLOR	SAMPLE NUMBER
						GRAVEL	SAND	SILT	CLAY	CL					
0					0-4' MU SAND. VERY WELL SORTED. 350-500µ, DRY → L MOISTURE SUBANGULAR - SUBROUND	0	5	85	0	0	SP	LM	RD	10YR 5/1 yellowish brown	1
5					4-19' MU SAND SAME AS C-5' WITH SOME CALZ NODULES. CORE RUINED AT BOTTOM. NO. OF C-5-19'	↓	↓	↓	↓	↓	↓	↓	↓	↓	2
10					9-20' MU-SAND SAME AS SAND							↓	↓		
15					10-14' 11-15' CLAYEY SILT W/ 10% GRAVEL SILENT, BUT, Slightly angular, conchoidal some calcz	10	0	0	0	20	CL	LM	DR	10YB 7/3 grey blue brown	3
20					15-18.5' CLAYEY SILT, SAME 14-17.5' 17.5-19' COARSE SAND W/ GRAVEL FRAGMENTS Angular - subangular med. poorly sorted, very loose nonconglomerate	↓	↓	↓	↓	↓	↓	↓	↓	↓	4
25					20-21.5' SAME AS 18.5-20 19-20.5 21.5-22.5' LL COARSE SAND 20.5-24' w/ pebbles (granitic) congl. med. sand grain size core larger loose	30	40	20	10	0	GW	LM	DR	variable sand	5



## FIELD LOG

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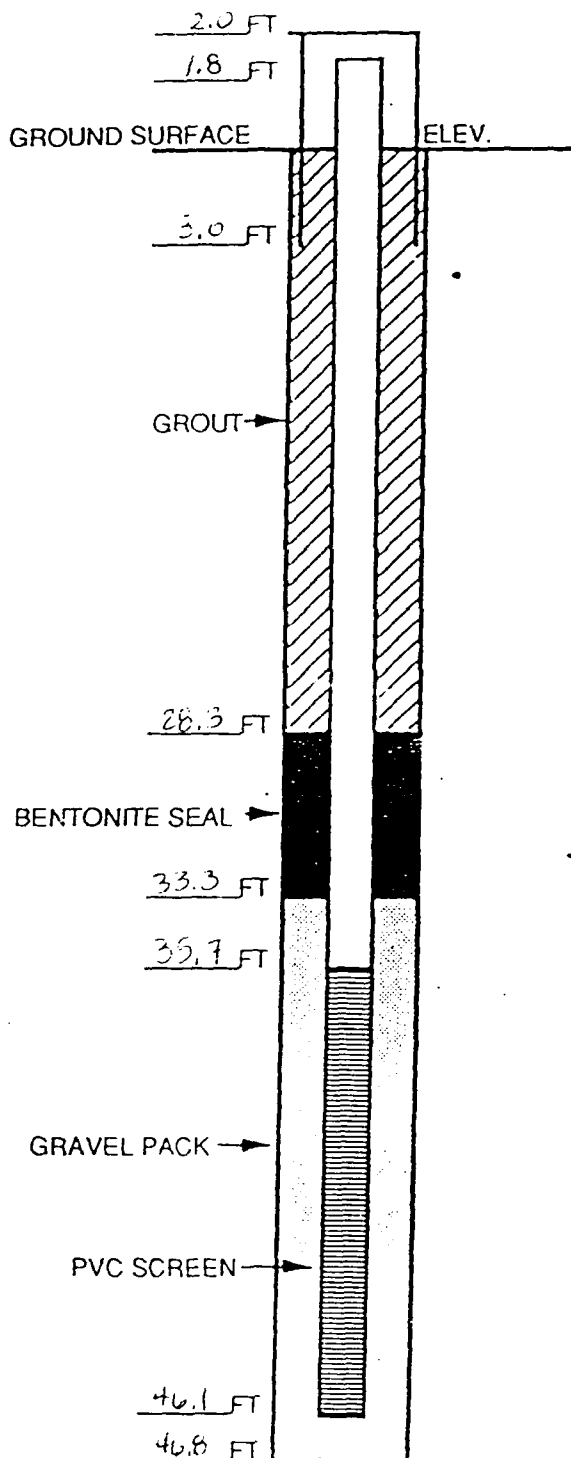
SITE ID: 24167

DEPTH (ft)	GRAPHIC LOG	WELL CONSTRUCTION	SAMPLE INTERVAL	RECOVERY (cm/cm)	DESCRIPTION (COLOR, TEXTURE, STRUCTURE)	ESTIMATED % OF					USCS ABBREV	MOISTURE	CONSISTENCY	COLOR	SAMPLE NUMBER
						GRAVEL	SAND			SILT					
							CO	MED	FINE						
25	0.0 0.0 0.0 0.0 0.0				24-24' 25-30' NO CORE HAD TO GO IN W/ CENTER BIT DUE TO GRAVEL W/ LG. STONES DRILLER SAYS THE THE LG GRAVEL WAS CONTINUOUS THROUGH SECTION.										
30	0.0 0.0				25-25' 25-25' 30-32' 32-34' 34-36' 36-38' 38-40' 40-42' 42-44' 44-46' 46-48' 48-50' 50-52' 52-54' 54-56' 56-58' 58-60' 60-62' 62-64' 64-66' 66-68' 68-70' 70-72' 72-74' 74-76' 76-78' 78-80' 80-82' 82-84' 84-86' 86-88' 88-90' 90-92' 92-94' 94-96' 96-98' 98-100'	30	50	20	0	0	SW	MC/VARIABLE		6	
					CORE ANALYSIS 34-36.5 COARSE SAND WELL SORTED SILTY AT BOTTOM OF CORE 36.5-39' LOST CORE	10	60	30	0	0	LM SP	MC/VARIABLE		7	
					43' 44' 39-44' - SAME AS 34-36.5 SOME MOIST FINE 43-44' DRILLER TIGHT W/ CENTER BIT	V	V	V	V	V	V	V	V	8	
					44-49' CLAYSTONE BEDROCK HIGHLY WEATHERED, FRACTURED CRUMBLY, MOD CO. STAINING FEW, LITTLE MOISTURE	0	0	0	0	100	CLAYSTONE	10YR 5/3 BROWN		9	

# WELL CONSTRUCTION LOG

JUL 18 DLA 7001

WELL NO. CMP-9



Measuring point is ground surface unless otherwise noted.

## DRILLING SUMMARY

Total Depth of Hole: 47' KH 46.8'  
Hole Diameter: 9 3/4"  
Drilling Company: LAYNE  
Driller: RON MUCKEY  
Rig Type: CME -55  
Bits: HOLLOW AUGER CME 6 1/4" (SIX) W/REPLACEABLE CARBIDES  
Geologist: KIM HEDBERG

## CONSTRUCTION TIME LOG

	Start		Finish	
	Date	Time	Date	Time
Drilling:	89187	0617	89188 KH	0640
Screen Placement:	89188	0703	89188	0716
Filter Placement:	89188	0722	89188	0905
Seal Placement:	89188	0908	89188	0923
Grouting:	89188	0925	89188	1024

## DEPTH TO WATER

Depth: 38.75' Date: 89188 Time: 1040

## WELL CONSTRUCTION MATERIALS

Grout (941bs) Seals Filter (100 lbs)  
Quantity: 10 BAGS 3 1/4 BUCKETS 4 1/3 BAGS  
Type: 1-2 PORTLAND CEMENT AMEN CONCRETE CO 1/4" TABLETS CS-1 SILICA SAND #10  
Screen  
Size: 10 Config: HORIZONTAL SLOT  
Area/Ft.:          Comp: PVC  
Inside Diam.: 4" Outside Diam.: 4"  
(SCHEDULE 40)

## COMMENTS

WELL WAS SANDED-IN AT 36'  
5 GALLONS DISTILLED WATER ADDED TO DISLodge AUGER

EBASCO SERVICES INCORPORATED

R L STOLLAR & ASSOCIATES, INC.

## FIELD LOG

PAGE 1 OF 2

26168 DLA GOOD

LOCATION SKETCH OR DESCRIPTION

PROJECT NAME				SITE TYPE		SITE ID		NO OF SAMPLES							
DRILLING COMPANY				DRILLER		DATE/TIME STARTED		DATE/TIME COMPLETED							
DRILLING EQUIPMENT : METHOD				TOTAL DEPTH		INIT. WATER LEVEL		24 HR WATER LEVEL							
SIZE AND TYPE OF BIT				SAMPLING METHOD		GEOLOGIST (signature/date)		CHECKED BY/DATE							
1" BASIN & MONITORING WELL INSTALLATION				WELL		CMP-9		11							
LAYNE				RON MUCKEY		11/18/77 1:00 PM		11/18/77 4:18 PM							
CME SS FOLLOW STEAM AUGER				47 ft 11 in 1433 cm		38.75 ft 11 in 1181 cm		11 in cm							
3 3/4" HOLLOW STEM				ROTARY SPLIT SPOON		R. H. C. 11/18/77									
DEPTH (ft)	GRAPHIC LOG	WELL CONSTRUCTION	SAMPLE INTERVAL	RECOVERY (cm/cm)	DESCRIPTION (COLOR, TEXTURE, STRUCTURE)	ESTIMATED % OF					USCS ABBREV	MOISTURE	CONSISTENCY	COLOR	SAMPLE NUMBER
						GRAVEL	COARSE	MED	FINE	SILT					
0-124			124/124		0-0.5' FINE CLAY					9/100	CH	VM	SP	7.5 YR 3/2	1
0.5-3.5					0.5-3.5' SANDY CLAY SILTY					50/100	ML	M	F	7.5 YR 3/4	2
3.5-4.0					3.5-4.0' DRYER SILTY CLAY SAND					80/100	SM	LM	L	7.5 YR 3/4	
4.0-9.0			143/152		4.0-9.0' DRY SILTY SAND SOME CALICHE					70/20/10	SM	LM	SP	7.5 YR 3/4	3
9.0-11.0			61/152		9.0-11.0' SILTY CLAY CONTAINS WHITE CALICHE					20/60/20	ML	MM	HR	10 YR 5/4	4
11.0-14.0			40/152		11.0-14.0' CLAY					20/80	MH	M	HR	10 YR 5/6	5
14.0-15.5					14.0-15.5' SANDY GRAVEL WELL SORTED POORLY	10	10	30	50	0	SP	M	HR	2.5 Y 5/4	6
15.5-17.5			14/152		15.5-17.5' SANDY GRAVEL SUBANGULAR MODERATELY SORTED	10	20	50	20	0	SP	M	HR		7

# FIELD LOG

2017-08-21  
2017-08-21 7:00 PM

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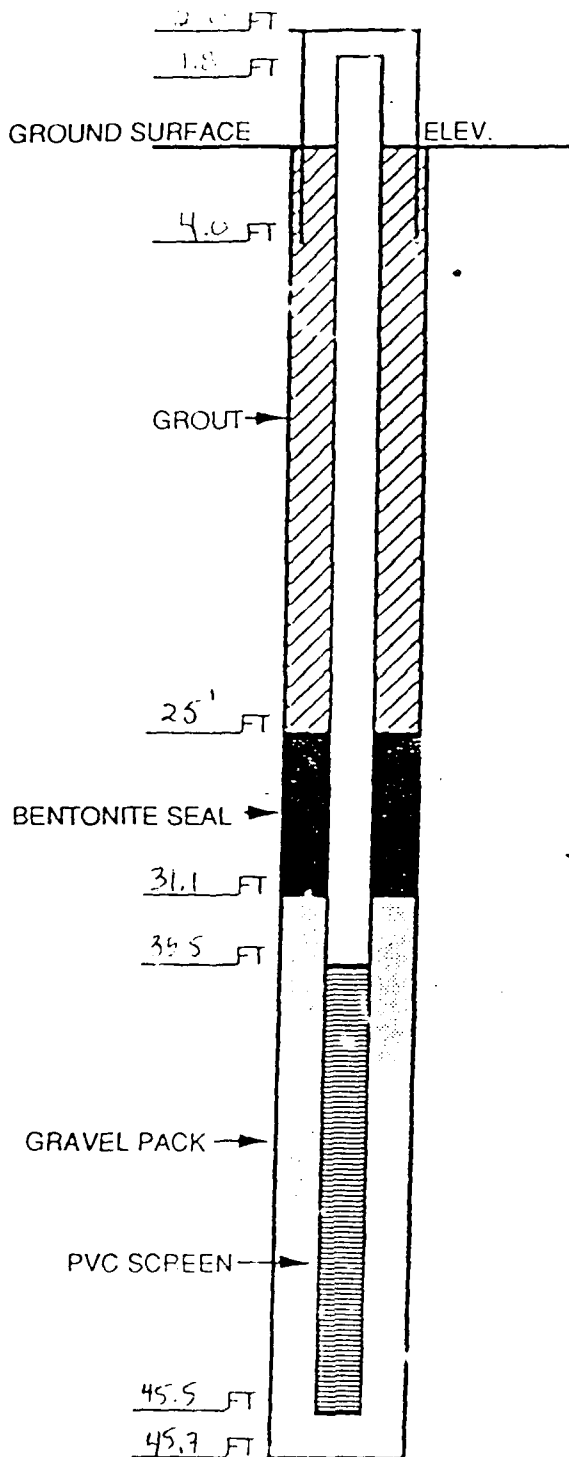
SITE ID: 1417-7

DEPTH (ft)	GRAPHIC LOG	WELL CONSTRUCTION	SAMPLE INTERVAL	RECOVERY (cm/cm)	DESCRIPTION (COLOR, TEXTURE, STRUCTURE)	ESTIMATED % OF					USCS ABBREV	MOISTURE	CONSISTENCY	COLOR	SAMPLE NUMBER
						GRAVEL	SAND			SILT/CL					
							CO	MED	FINE						
27-28				41/152	LOST BOTTOM 3.5' 24-28 25.5 SUBANGULAR SANDS & GRAVEL (DARK W/RTZ) CONTAINS 0.1' LAYER GNEISSIC ROCK	20	20	45	5	0	GM	6P	7.5 YR 4/6		7
29				40/152	LOST BOTTOM 3.4' ISLID OUT 29-30.1 SUBANGULAR SANDS & GRAVELS ML. SORTED	5	20	65	10	0	SP-M	SM	7.5 YR 4/4		SAME AS 7
34				66/152	LOST BOTTOM 2.8' WATER AT BOTTOM FOOT 34-35 CLAY LENSES SURROUND SANDS & GRAVELS 35-36.2 SUBANGULAR POORLY SORTED	40	10			50%	ML	W	10 YR 5/4		8
39				104/152	LOST TOP 2' 41-41.5' BLACK GRAVEL POORLY GRADED 41.5-44' DENVER SANDS (AND 43.5-44' SUBROUNDED WELL GRADED)	50	20	20	10		GP	W	7.5 YR 2/0		9
44				21/41	LOST BOTTOM 0.8' 44-45.5' DENVER SANDS 45.5-46.2' V. HARD CLAYSTONE SILTY WEATHERED DENVER IRON STAINED LAYERS TRIANGLE KH FRACTURED	80	20				SP	W	7.5 YR 4/4		10
47						80	10	10	40	50	W	HR	5 YR 4/1		11

# WELL CONSTRUCTION LOG

26169 SLA 90031

WELL NO. CMP-10



Measuring points ground surface unless otherwise noted

## DRILLING SUMMARY

Total Depth of Hole: 45.7'  
 Hole Diameter: 4 3/4"  
 Drilling Company: LAYNE  
 Driller: R. MUCKEY, A SCHWENMAKER, L RING  
 Rig Type: CMESS PULP, REAMED TO 24'; CME-75 COMP HOLE  
 Bits: HOLLOW AUGER 6 1/4" W/O REPLACEABLE CARBIDES  
 Geologist: KIM HEDBERG

## CONSTRUCTION TIME LOG

	Start		Finish	
	Date	Time	Date	Time
Drilling:	89200	0832	89202	0803
Screen Placement:	89202	0824	89202	0827
Filter Placement:	89202	0827	89202	0850
Seal Placement:	89202	0858	89202	1013
Grouting:	89202	1051	89202	1101

## DEPTH TO WATER

Depth: 38.45' Date: 89200 Time: 0952

## WELL CONSTRUCTION MATERIALS

	Grout	Seals	Filter
Quantity:	<u>4 BAGS (100#)</u>	<u>3 1/2 BULLETS</u>	<u>5 BAGS (100#)</u>
Type:	<u>PORTLAND CEMENT TYPE 1 &amp; 2 Screen</u>	<u>ENVIRONMENTAL PELLETS (3/8")</u>	<u>COARSE SILICA SAND</u>
Size:	<u>0.10</u>	Config: <u>HORIZONTAL SLOT</u>	
Area/Ft:		Comp: <u>PVC</u>	
Inside Diam:	<u>4"</u>	Outside Diam.: <u>4"</u>	

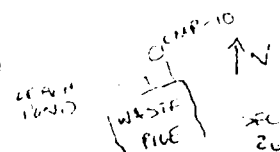
## COMMENTS

CMESS BROKE DOWN 892020 HOLE  
FINISHED W/ CME-75 89202  
DRILLER'S R. MUCKEY PULP, REAMED TO 24';  
A SCHWENMAKER, REAMED TO 24.5'; L RING  
FINISHED REAMING AND CONSTRUCTED WELL  
EBASCO SERVICES INCORPORATED  
BENTONITE PLUGGED AUGER @ 28.7', SO ALL  
AUGER WAS REMOVED. HOLE DEPTH WAS 30'  
SO WELL CAVED ABOUT 0.5' 5' BENTONITE ADDED IN TOP

## FIELD LOG

PAGE 1 OF 2

26169 DLA 90031

LOCATION SKETCH  
OR DESCRIPTION

PROJECT NAME CMP BASIN F MONITORING WELL INSTALLATION				SITE TYPE WELL		SITE ID CMP-10		NO OF SAMPLES 9									
DRILLING COMPANY LAYNE		DRILLER (CME-75 & SMOCK) CME-SS RON MUCKEY		DATE/TIME STARTED 89200/0532 REAMED 89200/1242		DATE/TIME COMPLETED 89200/1036 REAMED											
DRILLING EQUIPMENT: METHOD (CME-75) CME-SS HOLLOW STEM AUGER				TOTAL DEPTH ft cm 30.45 ft		INIT. WATER LEVEL ft cm		24 HR WATER LEVEL ft cm									
SIZE AND TYPE OF BIT 3 3/4" PILOT 6 1/4" BEAM (ID)		SAMPLING METHOD CONTINUOUS SPLITSPOON		GEOLOGIST (signature/date) R. L. Stollar 89200		CHECKED BY/DATE											
DEPTH (ft)	GRAPHIC LOG	WELL CONSTRUCTION	SAMPLE INTERVAL	RECOVERY (cm/cm)	DESCRIPTION (COLOR, TEXTURE, STRUCTURE)	ESTIMATED % OF					USCS ABBREV	MOISTURE	CONSISTENCY	COLOR	SAMPLE NUMBER		
						GRAVEL	SAND CO MED FINE	SILT	CLAY	CL							
0		↓	12/12	12/12	FINE SANDY CLAY 0.4' SILTY				5	30	5	ML	LM	NR	10YR 4/6	1	
4			5	13/13	13/13	4'-8.5' SILTY CLAY CONTAINS CALICHE 8.5'-10' LOST LAST 0.5'				40	40	ML	LM	NR	10YR 7/4 10YR 6/6	2	
5			13/13	13/13	9'-9.7' LOST TOP 0.7' 9.7'-12' SILTY CLAY W/ CALICHE 12'-12.5' GRAVELLY CLAY (RZ, R, BLO, M)	20	10	10	10	50	20	20	ML	M	NR	10YR 5/4 10YR 4/6	3
4			13/13	13/13	13.5'-14.0' GRAVELLY SAND (RZ, PL, BLO, M) 12.5'-14.0' FULLY SORTED SUBROUNDED	20	20	35	15	0	0	0	LM	LM	NR	10YR 7/6	4
15			13/13	13/13	14'-10.5' POORLY SORTED GRAVELLY SAND (RZ ABOVE) MUSE ROCK FLOZ AT BOTTOM 10.5'-14' LOST BOTTOM 2.5'	20	30	35	15	0	0	0	LM	LM	NR	10YR 4/8	4
4		↓	13/13	13/13	14.5'-15.3' SAND LAYER	5	5	5	80	5	5	SM	LM	NR	10YR 3/6	5	
20			13/13	13/13	19'-21.0' POORLY SORTED GRAVELLY SAND SUBANGULAR BECOMES FINER NEAR 21'	20	30	30	20	0	0	0	LM	M	NR	10YR 5/4	5
24			13/13	13/13	21.0'-21.8' SILTY SAND CONTAINS MICA, QZ 21.8'-24' LOST SAND BOTTOM 2.2'					40	40	20	SM	LM	NR	10YR 7/6	5

DRILLERS: 2 MUCKEY PILOT, REAMED TO 24' (CME-SS)

A SHOEMAKER REAMED TO 29.5' (CME-75)

1 RING FINISHED REAMING AND CONSTRUCTED WELL (CME-75)

# FIELD LOG

26167 DLA 90031  
260

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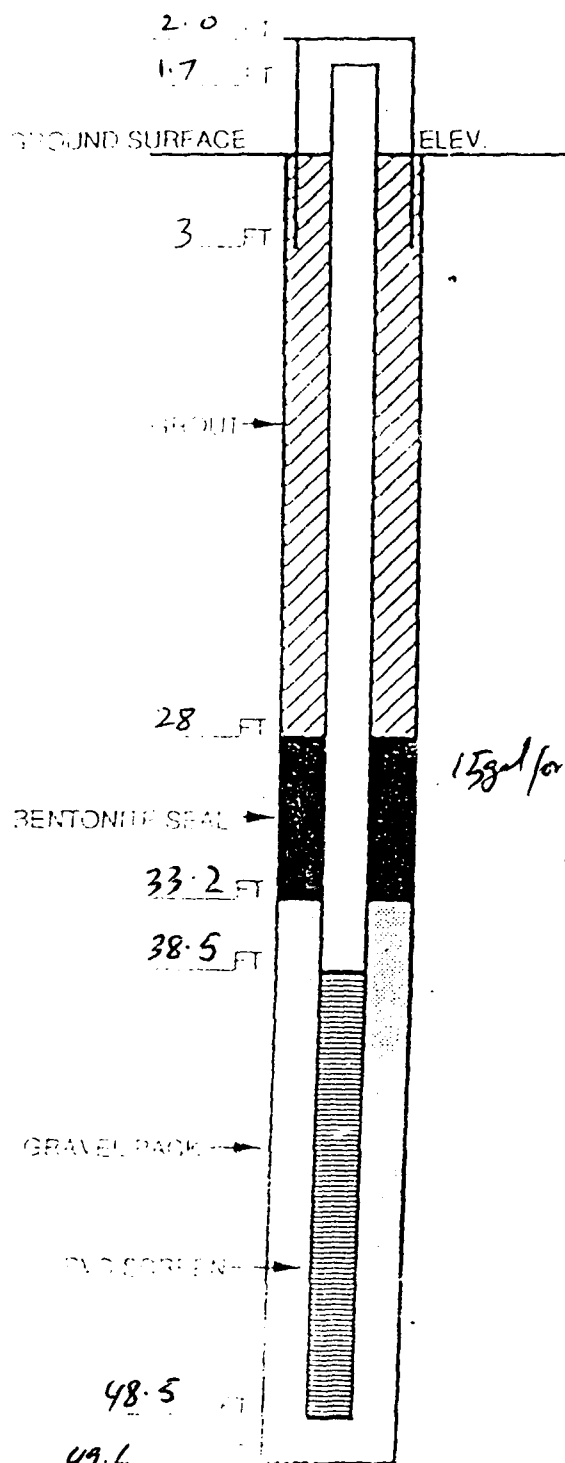
SITE ID: CMP-10

DEPTH (11)	GRAPHIC LOG	WELL CONSTRUCTION	SAMPLE INTERVAL	RECOVERY (cm/cm)	DESCRIPTION (COLOR, TEXTURE, STRUCTURE)	ESTIMATED % OF					USCS ABRV	MOISTURE	CONSISTENCY	COLOR	SAMPLE NUMBER
						GRAVEL	SAND			SILT					
							CO	MED	FINE						
24					24-25.7' MOD SORTED SAND & GRAVELS SUBROUNDED	10	20	40	20	10	SM	LM	NE	7.5YR 4/4	6
					25.7-26.5' POORLY SORTED SUBROUNDED SILTY SAND, ROCK FLOUR QTZ, MUSL, FLAK, AMPH	5	10	30	40	15	SM	D	NR	10YR 6/3	
29					26.5-29' LOST BOTTOM 2.5'										7
					29-30' POORLY SORTED SANDS & GRAVELS SUBROUNDED QTZ, FLK	20	30	40	10	0	GW	LM	NR	10YR 5/6	
					30-31' MOD. SORTED SANDS & GRAVELS	2	10	40	40	8	SM	LM	NR	10YR 6/4	
					31-32' FINE SANDS ROCK FLOUR	2		10	80	8	SM	LM	NR	10YR 7/1	
34					32-34' LOST BOTTOM										8
					34-35.2' POORLY SORTED SANDS & GRAVEL SUBROUNDED QTZ, FLK, MUSL, BIG AMPH	10	40	45	5	0	GW	WM	NR	7.5YR 5/4	
					35.2-36.5' WET POORLY SORTED S.S.G.	5	30	50	15	0	GM	W	NR	7.5YR 4/4	
					36.5-39' LOST BOTTOM 2.5'										
39					39-40' SUBROUNDED MOD SORTED GRAVELLY SAND	40	30	25	5	0	GW	H	NR	7.5YR 6/2	9
					40-42' LOST DUE TO SAMPLE REMOVAL (RICK REMOVED BY USE OF BIT)										
					42-42.3' DENVER SANDS										
					42.3-44' DENVER CLAYSTONE										
44					MORE LH RIDDLED W/IRON STAINING					10/40				5YR 4/1	IRON STAIN
					44-44.2' LOST LAST 1.2' NO SAMPLE									2.5YR 5/6	

# WELL CONSTRUCTION LOG

CMD-11

WELL NO. 26170



## DRILLING SUMMARY

Total Depth of Hole: 49' 8" L  
 Hole Diameter: 10"  
 Drilling Company: Layne Western  
 Driller: Larry Rung  
 Rig Type: CME-75  
 Bits: 3 3/4" ID Pilot 16 1/4" ID Ream  
 Geologist: Tang Ahmad

## CONSTRUCTION TIME LOG

	Start		Finish	
	Date	Time	Date	Time
Ream	89195	0915	89195	1005/1142
Drilling	89195	0632	89195	0748
Screen Placement	89195	1150	89195	1158
Filter Placement	89195	1200	89195	1217
Seal Placement	89195	1219	89195	1228
Grouting	89195	1311	89195	1340

## DEPTH TO WATER

Depth: 541 Dry hole Date: 89195 Time: 0727  
42.5 after drilling (30 Mins.) Time: 0748

## WELL CONSTRUCTION MATERIALS

	Grout	Seals	Filter
Quantity	<u>732 lbs cement</u> <u>38 lbs Bent.</u>	<u>150 lbs</u>	<u>564 lbs</u>
Type		<u>14" Tablets</u>	<u>10/ silica</u> <u>120</u>
Screen			
Size	<u>4" ID 4 1/2" OD</u>	Config: <u>10.0 slot Factory</u>	
Area Ft		Comp: <u>schedule 40 PVC</u>	
Inside Diam.	<u>4</u>	Outside Diam.: <u>4.5</u>	

## COMMENTS

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# FIELD LOG

PAGE 1 OF 2.

LOCATION SKETCH  
OR DESCRIPTION

(26)

D.F.

N

PROJECT NAME		SITE TYPE		SITE ID		NO OF SAMPLES	
		Well		(CMP#) 26170		10	
DRILLING COMPANY		DRILLER		DATE/TIME STARTED		DATE/TIME COMPLETED	
Lape Western		Larry King		8/19/5 1 0636		8/19/5 1 0748	
DRILLING EQUIPMENT : METHOD				TOTAL DEPTH		INIT. WATER LEVEL	
CME-75 / Hollow stem				49 ft		24 HR WATER LEVEL	
SIZE AND TYPE OF BIT		SAMPLING METHOD		GEOLOGIST (signature/date)		CHECKED BY/DATE	
3 1/4 bit 10		shot spoon		Larry King			

[illegible]

## FIELD LOG

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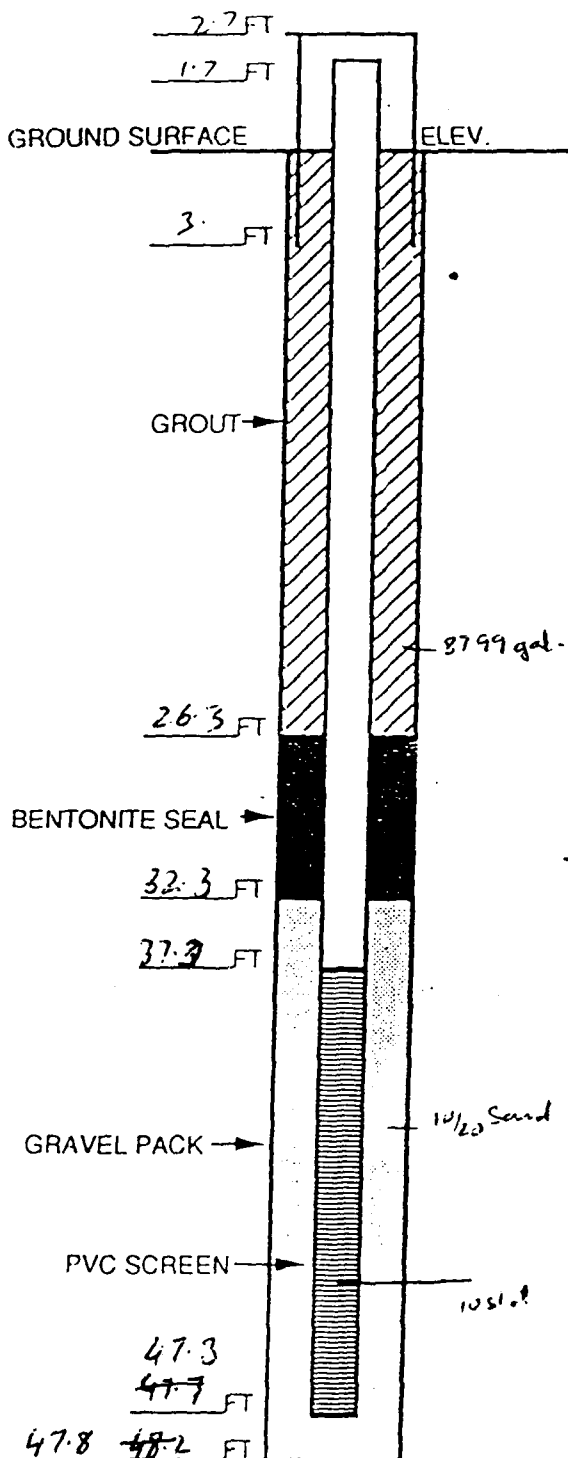
SITE ID: 26170

DEPTH (ft)	GRAPHIC LOG	WELL CONSTRUCTION	SAMPLE INTERVAL	RECOVERY (cm/cm)	DESCRIPTION (COLOR, TEXTURE, STRUCTURE)	ESTIMATED % OF					USCS ABBREV	MOISTURE	CONSISTENCY	COLOR	SAMPLE NUMBER
						GRAVEL	SAND			SILT					
							CO	ME	FI						

25.0 27.0		grout	97.55 152		24-27 2': well graded gravelly sand. increased gravel. increased coarse sand. gravel reaches up 2" in size (2%). gravel rounded to subrounded. Sand Ang. to S.A. 27.2-29 lost core	15	50	30	10	5	SW	m	SR	10Y 6/8	None
L.C. 20.0 30.0			106.68 152		29-30.5': - Well graded gravelly sand as at 24. 30.5-31.7': - well sorted sand 1.5-1.0. 31.7-32.5': well graded sand as at 29 feet (32.5-34) lost core	0	80	10	0	SP	m	SR	10Y 6/4	31	
L.C. 35.0			67.05 152		34-34.5': Sandy silt. semi plastic. gritty. 34.5-36.2': - well graded gravelly sand as at 29. rounded to subrounded gravel. angular to subangular sand. 36.2-39. lost core	0	0	0	30	40/30	CL	m	SR	10Y 6/1	35-2
L.C. 40.0			74.48 152		39-40.8' clayey silt with sand finely graded 40.8-42.1' well graded gravelly sand. (Hardwell sorted) 1-1.5. 42.1-44 lost core.	0	0	0	40	50/10	ML	wet m	SR	10Y 5/3	40.2 41
L.C. 45.0			146.30 152		44-48 8' - claystone with fractures and micaceous (Red) at fractures. 48.8-49. - Darker claystone fine fractures lignitic trend.						m	m	SR	10Y 6/2	45 48.8

# WELL CONSTRUCTION LOG

WELL NO. 26171 (CMP-5)



Measuring point is ground surface unless otherwise noted.

## DRILLING SUMMARY

Total Depth of Hole: 47.8'  
Hole Diameter: 10'  
Drilling Company: Layne Western  
Driller: Alta S. S. S. S.  
Rig Type: CME-75  
Bits: 3 3/4" ID Drill / 10" O.D. Beam  
Geologist: Torrey Ahmud.

## CONSTRUCTION TIME LOG

	Start		Finish	
	Date	Time	Date	Time
Reaming:	89200	1450	89201	0722
Drilling:	89200	1010	89200	1152
Screen Placement:	89201	0727	892001	0736
Filter Placement:	89201	0740	892001	0802
Seal Placement:	89201	0804	892001	0825
Grouting:	89201	0930	89201	1010

## DEPTH TO WATER

Depth: 40.5' Date: 89200 Time: 1132 / 1151

## WELL CONSTRUCTION MATERIALS

Grout: 584 lbs cement Seals: 5 Buckets = 250 #1700 Filter: 552 lbs  
Quantity: 28 lbs Bentonite Type: 100% alkali cement Enveloping: 3/8" Colorado Silver  
Type: type 1 82 Portland Screen Wyp-Ben Inc. 10/20 sand

Size: 10' Config: 10 slots /  
Area/ft.:  Comp: Schedule 40 PVC  
Inside Diam.: 4" Outside Diam.: 4.5"

## COMMENTS

\*1 This includes some losses due to spills which are not that much.  
\*2 Each Bucket is 0.52 ft<sup>3</sup>. we have 55' Annular column of Bentonite fully hydrated.

# FIELD LOG

PAGE 1 OF 1



PROJECT NAME <b>EMA CMP. Bison F. Anding</b>		SITE TYPE <b>well</b>		SITE ID <b>26171 (Lamp)</b>		NO. OF SAMPLES <b>1</b>	
DRILLING COMPANY <b>Hayne Construction</b>		DRILLER <b>Allen Shoemaker</b>		DATE/TIME STARTED <b>8/4/00 1010</b>		DATE/TIME COMPLETED <b>8/4/00 1115</b>	
DRILLING EQUIPMENT METHOD <b>CME-75</b>				TOTAL DEPTH <b>47.8 ft</b>		INT. WATER LEVEL <b>40.5 ft</b>	
				cm		cm	
SIZE AND TYPE OF BIT <b>4 1/2" x 10'00'</b>		SAMPLING METHOD <b>1 1/2" Core Barrel</b>		GEOLOGIST (signature/date) <b>Jerry Blum</b>		CHECKED BY/DATE	

DEPTH (ft)	GRAPHIC LOG	WELL CONSTRUCTION	SAMPLE INTERVAL RECOVERY (cm/cm)	DESCRIPTION (COLOR, TEXTURE, STRUCTURE)	ESTIMATED % OF					USCS ABBREV	MOISTURE	CONSISTENCY	COLOR	SAMPLE NUMBER
					GRAVEL	SAND			SILT					
						CO	MED	FINE						
0			12.14/15.2	0-4' - clayey silt with some medium grained sand. sand fraction > 20% is 8	0	0	0	10	80	ML	D	8R	10K 5/6	5'
4			15.2/15.2	4-7' - clayey silt with some sand. > 20% is 8	0	0	0	0	100	ML	D	8R	10K 5/6	
7			15.2/15.2	7-11' - clayey silt with some sand. silty clay. silty clay fraction	0	0	0	0	100	ML	D	8R	10K 5/6	8' mixed
11			15.2/15.2	11-12' - clayey silt with some sand. silty clay. silty clay fraction	0	0	0	0	100	ML	D	8R	10K 5/6	
12			15.2/15.2	12-12.2' - clayey silt with some sand. silty clay. silty clay fraction	0	0	0	0	100	ML	D	8R	10K 5/6	
12.2			15.2/15.2	12.2-12.4' - clayey silt with some sand. silty clay. silty clay fraction	0	0	0	0	100	ML	D	8R	10K 5/6	
12.4			15.2/15.2	12.4-12.6' - clayey silt with some sand. silty clay. silty clay fraction	0	0	0	0	100	ML	D	8R	10K 5/6	
12.6			15.2/15.2	12.6-12.8' - clayey silt with some sand. silty clay. silty clay fraction	0	0	0	0	100	ML	D	8R	10K 5/6	
12.8			15.2/15.2	12.8-13.0' - clayey silt with some sand. silty clay. silty clay fraction	0	0	0	0	100	ML	D	8R	10K 5/6	
13.0			15.2/15.2	13.0-13.2' - clayey silt with some sand. silty clay. silty clay fraction	0	0	0	0	100	ML	D	8R	10K 5/6	
13.2			15.2/15.2	13.2-13.4' - clayey silt with some sand. silty clay. silty clay fraction	0	0	0	0	100	ML	D	8R	10K 5/6	
13.4			15.2/15.2	13.4-13.6' - clayey silt with some sand. silty clay. silty clay fraction	0	0	0	0	100	ML	D	8R	10K 5/6	
13.6			15.2/15.2	13.6-13.8' - clayey silt with some sand. silty clay. silty clay fraction	0	0	0	0	100	ML	D	8R	10K 5/6	
13.8			15.2/15.2	13.8-14.0' - clayey silt with some sand. silty clay. silty clay fraction	0	0	0	0	100	ML	D	8R	10K 5/6	
14.0			15.2/15.2	14.0-14.2' - clayey silt with some sand. silty clay. silty clay fraction	0	0	0	0	100	ML	D	8R	10K 5/6	
14.2			15.2/15.2	14.2-14.4' - clayey silt with some sand. silty clay. silty clay fraction	0	0	0	0	100	ML	D	8R	10K 5/6	
14.4			15.2/15.2	14.4-14.6' - clayey silt with some sand. silty clay. silty clay fraction	0	0	0	0	100	ML	D	8R	10K 5/6	
14.6			15.2/15.2	14.6-14.8' - clayey silt with some sand. silty clay. silty clay fraction	0	0	0	0	100	ML	D	8R	10K 5/6	
14.8			15.2/15.2	14.8-15.0' - clayey silt with some sand. silty clay. silty clay fraction	0	0	0	0	100	ML	D	8R	10K 5/6	
15.0			15.2/15.2	15.0-15.2' - clayey silt with some sand. silty clay. silty clay fraction	0	0	0	0	100	ML	D	8R	10K 5/6	
15.2			15.2/15.2	15.2-15.4' - clayey silt with some sand. silty clay. silty clay fraction	0	0	0	0	100	ML	D	8R	10K 5/6	
15.4			15.2/15.2	15.4-15.6' - clayey silt with some sand. silty clay. silty clay fraction	0	0	0	0	100	ML	D	8R	10K 5/6	
15.6			15.2/15.2	15.6-15.8' - clayey silt with some sand. silty clay. silty clay fraction	0	0	0	0	100	ML	D	8R	10K 5/6	
15.8			15.2/15.2	15.8-16.0' - clayey silt with some sand. silty clay. silty clay fraction	0	0	0	0	100	ML	D	8R	10K 5/6	
16.0			15.2/15.2	16.0-16.2' - clayey silt with some sand. silty clay. silty clay fraction	0	0	0	0	100	ML	D	8R	10K 5/6	
16.2			15.2/15.2	16.2-16.4' - clayey silt with some sand. silty clay. silty clay fraction	0	0	0	0	100	ML	D	8R	10K 5/6	
16.4			15.2/15.2	16.4-16.6' - clayey silt with some sand. silty clay. silty clay fraction	0	0	0	0	100	ML	D	8R	10K 5/6	
16.6			15.2/15.2	16.6-16.8' - clayey silt with some sand. silty clay. silty clay fraction	0	0	0	0	100	ML	D	8R	10K 5/6	
16.8			15.2/15.2	16.8-17.0' - clayey silt with some sand. silty clay. silty clay fraction	0	0	0	0	100	ML	D	8R	10K 5/6	
17.0			15.2/15.2	17.0-17.2' - clayey silt with some sand. silty clay. silty clay fraction	0	0	0	0	100	ML	D	8R	10K 5/6	
17.2			15.2/15.2	17.2-17.4' - clayey silt with some sand. silty clay. silty clay fraction	0	0	0	0	100	ML	D	8R	10K 5/6	
17.4			15.2/15.2	17.4-17.6' - clayey silt with some sand. silty clay. silty clay fraction	0	0	0	0	100	ML	D	8R	10K 5/6	
17.6			15.2/15.2	17.6-17.8' - clayey silt with some sand. silty clay. silty clay fraction	0	0	0	0	100	ML	D	8R	10K 5/6	
17.8			15.2/15.2	17.8-18.0' - clayey silt with some sand. silty clay. silty clay fraction	0	0	0	0	100	ML	D	8R	10K 5/6	
18.0			15.2/15.2	18.0-18.2' - clayey silt with some sand. silty clay. silty clay fraction	0	0	0	0	100	ML	D	8R	10K 5/6	
18.2			15.2/15.2	18.2-18.4' - clayey silt with some sand. silty clay. silty clay fraction	0	0	0	0	100	ML	D	8R	10K 5/6	
18.4			15.2/15.2	18.4-18.6' - clayey silt with some sand. silty clay. silty clay fraction	0	0	0	0	100	ML	D	8R	10K 5/6	
18.6			15.2/15.2	18.6-18.8' - clayey silt with some sand. silty clay. silty clay fraction	0	0	0	0	100	ML	D	8R	10K 5/6	
18.8			15.2/15.2	18.8-19.0' - clayey silt with some sand. silty clay. silty clay fraction	0	0	0	0	100	ML	D	8R	10K 5/6	
19.0			15.2/15.2	19.0-19.2' - clayey silt with some sand. silty clay. silty clay fraction	0	0	0	0	100	ML	D	8R	10K 5/6	
19.2			15.2/15.2	19.2-19.4' - clayey silt with some sand. silty clay. silty clay fraction	0	0	0	0	100	ML	D	8R	10K 5/6	
19.4			15.2/15.2	19.4-19.6' - clayey silt with some sand. silty clay. silty clay fraction	0	0	0	0	100	ML	D	8R	10K 5/6	
19.6			15.2/15.2	19.6-19.8' - clayey silt with some sand. silty clay. silty clay fraction	0	0	0	0	100	ML	D	8R	10K 5/6	
19.8			15.2/15.2	19.8-20.0' - clayey silt with some sand. silty clay. silty clay fraction	0	0	0	0	100	ML	D	8R	10K 5/6	
20.0			15.2/15.2	20.0-20.2' - clayey silt with some sand. silty clay. silty clay fraction	0	0	0	0	100	ML	D	8R	10K 5/6	
20.2			15.2/15.2	20.2-20.4' - clayey silt with some sand. silty clay. silty clay fraction	0	0	0	0	100	ML	D	8R	10K 5/6	
20.4			15.2/15.2	20.4-20.6' - clayey silt with some sand. silty clay. silty clay fraction	0	0	0	0	100	ML	D	8R	10K 5/6	
20.6			15.2/15.2	20.6-20.8' - clayey silt with some sand. silty clay. silty clay fraction	0	0	0	0	100	ML	D	8R	10K 5/6	
20.8			15.2/15.2	20.8-21.0' - clayey silt with some sand. silty clay. silty clay fraction	0	0	0	0	100	ML	D	8R	10K 5/6	
21.0			15.2/15.2	21.0-21.2' - clayey silt with some sand. silty clay. silty clay fraction	0	0	0	0	100	ML	D	8R	10K 5/6	
21.2			15.2/15.2	21.2-21.4' - clayey silt with some sand. silty clay. silty clay fraction	0	0	0	0	100	ML	D	8R	10K 5/6	
21.4			15.2/15.2	21.4-21.6' - clayey silt with some sand. silty clay. silty clay fraction	0	0	0	0	100	ML	D	8R	10K 5/6	
21.6			15.2/15.2	21.6-21.8' - clayey silt with some sand. silty clay. silty clay fraction	0	0	0	0	100	ML	D	8R	10K 5/6	
21.8			15.2/15.2	21.8-22.0' - clayey silt with some sand. silty clay. silty clay fraction	0	0	0	0	100	ML	D	8R	10K 5/6	
22.0			15.2/15.2	22.0-22.2' - clayey silt with some sand. silty clay. silty clay fraction	0	0	0	0	100	ML	D	8R	10K 5/6	
22.2			15.2/15.2	22.2-22.4' - clayey silt with some sand. silty clay. silty clay fraction	0	0	0	0	100	ML	D	8R	10K 5/6	
22.4			15.2/15.2	22.4-22.6' - clayey silt with some sand. silty clay. silty clay fraction	0	0	0	0	100	ML	D	8R	10K 5/6	
22.6			15.2/15.2	22.6-22.8' - clayey silt with some sand. silty clay. silty clay fraction	0	0	0	0	100	ML	D	8R	10K 5/6	
22.8			15.2/15.2	22.8-23.0' - clayey silt with some sand. silty clay. silty clay fraction	0	0	0	0	100	ML	D	8R	10K 5/6	
23.0			15.2/15.2	23.0-23.2' - clayey silt with some sand. silty clay. silty clay fraction	0	0	0	0	100	ML	D	8R	10K 5/6	
23.2			15.2/15.2	23.2-23.4' - clayey silt with some sand. silty clay. silty clay fraction	0	0	0	0	100	ML	D	8R	10K 5/6	
23.4			15.2/15.2	23.4-23.6' - clayey silt with some sand. silty clay. silty clay fraction	0	0	0	0	100	ML	D	8R	10K 5/6	
23.6			15.2/15.2	23.6-23.8' - clayey silt with some sand. silty clay. silty clay fraction	0	0	0	0	100	ML	D	8R	10K 5/6	
23.8			15.2/15.2	23.8-24.0' - clayey silt with some sand. silty clay. silty clay fraction	0	0	0	0	100	ML	D	8R	10K 5/6	
24.0			15.2/15.2	24.0-24.2' - clayey silt with some sand. silty clay. silty clay fraction	0	0	0	0	100	ML	D	8R	10K 5/6	
24.2			15.2/15.2	24.2-24.4' - clayey silt with some sand. silty clay. silty clay fraction	0	0	0	0	100	ML	D	8R	10K 5/6	
24.4			15.2/15.2	24.4-24.6' - clayey silt with some sand. silty clay. silty clay fraction	0	0	0	0	100	ML	D	8R	10K 5/6	
24.6			15.2/15.2	24.6-24.8' - clayey silt with some sand. silty clay. silty clay fraction	0	0	0	0	100	ML	D	8R	10K 5/6	
24.8			15.2/15.2	24.8-25.0' - clayey silt with some sand. silty clay. silty clay fraction	0	0	0	0	100	ML	D	8R	10K 5/6	
25.0			15.2/15.2	25.0-25.2' - clayey silt with some sand. silty clay. silty clay fraction	0	0	0	0	100	ML	D	8R	10K 5/6	

## FIELD LOG

PAGE 2 OF 2

SITE ID: 26171 CWR 5

DEPTH (ft)	GRAPHIC LOG	WELL CONSTRUCTION	SAMPLE INTERVAL	RECOVERY (cm/cm)	DESCRIPTION (COLOR, TEXTURE, STRUCTURE)	ESTIMATED % OF					USCS ABBREV	MOISTURE	CONSISTENCY	COLOR	SAMPLE NUMBER
						GRAVEL	SAND			SILT					
							COARSE	MED	FINE						
				0 152	24-29'- Core Completely lost large stable plugged split spoon.										
30				5486 152	29-30.8' - Well graded gravelly sand. chert nodules seen at 29'. 30.8-34' - lost core. large cobbles get stuck in split spoon.	8	50	30	12	9%	Su	m	SoR	10Y 6/6	30'
35				1872 152	34-34.6' - well graded gravelly sand air at 29'. 34.6-39' - lost core. cobble stuck in split spoon	8	50	30	12	4%	Su	m	SoR	10Y 6/6	40'
40				6046 152	39-41' : Well graded gravelly sand same as at 34. 41' - Some dark coloured thin 39.4 to 41' 41-42' : lost core.	8	50	30	12	4%	Su	w	SoR	10Y 6/4 8	
45				7012 152	42-42.5' - Dark colored gravelly sand. well graded. Same as at 39.4. 42.5-44.3 :- Remains claylike with silty fine interlayers. Fractures red discolouration at fractures.							w	m	10Y 6/6	
50				8224 152	44.3-45.4' - Dark clayline under mixed with some sandy siltstone. Fractures. red discolouration at fractures. 45.4-47' - Dry Darker clayline possibly higher carbon content.							w	m	10Y 6/6	

## FIELD LOG

PAGE 1 OF 2

26172 DLA 90031

LOCATION SKETCH  
OR DESCRIPTION

100' BASIN  
100' DRAIN  
AMP 13  
OH  
L100'

PROJECT NAME 1 MI BASIN MONITORING WELL INSTALLATION				SITE TYPE WELL		SITE ID AMP 13		NO OF SAMPLES 7						
DRILLING COMPANY Layne		DRILLER RAN MUCKEY		DATE/TIME STARTED 5/26/11 10:15		DATE/TIME COMPLETED 5/26/11 10:10								
DRILLING EQUIPMENT: METHOD CME 55 HOLLOW STEM AUGER				TOTAL DEPTH 33 ft 1000 cm		INIT. WATER LEVEL NA ft NA cm		24 HR WATER LEVEL NA ft NA cm						
SIZE AND TYPE OF BIT 3 1/4" PCDT		SAMPLING METHOD ASTM D1586 SPT/SPDR		GEOLOGIST (signature/date) RAN MUCKEY			CHECKED BY/DATE							
DEPTH (ft)	GRAPHIC LOG	WELL CONSTRUCTION	SAMPLE INTERVAL	RECOVERY (cm/cm)	DESCRIPTION (COLOR, TEXTURE, STRUCTURE)	ESTIMATED % OF				USCS ABBREV	MOISTURE	CONSISTENCY	COLOR	SAMPLE NUMBER
						GRAVEL	SAND CO MED FINE	SILT	CL					
0					0-1.7' HARD CONTAINS MICA, QTZ					ML	M			
1.7-3.0'					SANDY SILT CONTAINS CALCITE					CL			3/4	
3.0-4.4'					SANDY SILT (A-ABOVE)					ML	LM	MIR	7.5 YR	
4.4-5.5'					SILTY CLAY W/CALCITE					ML	LM	MIR	5/6	2
5.5-6.5'					SILTY CLAY W/SAND (QTZ), CALCITE		2	5		ML	LM	MIR	7.5 YR	
6.5-8'					LOST SAMPLE									
8-10.3'					SILTY CLAY W/SAND, CALCITE (A-ABOVE)					ML	M	NEC	10 YR	
10.3-12.4'					SILTY CLAY W/ GRAVEL AND CALCITE	5	5	10		ML	M	NEC	10 YR	3
12.4-14.7'					SILTY CLAY W/ AND CONTAINS CALCITE			3		ML	M	NEC	10 YR	4
14.7-17.5'					SILTY CLAY W/ AND (A-ABOVE) LAST 0.3' CONTAINS CALCITE					ML	M	NEC	10 YR	5
17.5-19'					LOST SAMPLE									
19-20.5'					LOST SAMPLE									
20.5-22.5'					SANDY SILT	5	0	0	10	ML	NEC	10 YR	5	5
22.5-24.5'					POORLY SORTED GRAVELLY SAND SUBANGULAR	5	30	40	20	ML	NEC	7.5 YR	3/4	
24.5-27.5'					POORLY SORTED SANDY GRAVEL PER FOR SUBANGULAR	5	20	30	35	D	NEC	10 YR	4	
27.5-29'					LOST SAMPLE									

27.5-29' NO SAMPLE

TOOL BIT USED

# FIELD LOG

26172 DLA 90031

PAGE 2 OF 2

SITE ID: 112-15

DEPTH (ft)	GRAPHIC LOG	WELL CONSTRUCTION	SAMPLE INTERVAL	RECOVERY (cm/cm)	DESCRIPTION (COLOR, TEXTURE, STRUCTURE)	ESTIMATED % OF					USCS ABBREV	MOISTURE	CONSISTENCY	COLOR	SAMPLE NUMBER
						GRAVEL	SAND	SAND	SAND	SILT/CL					
24			24-25	6/151	MOD. SORTED SANDS & GRAVEL MA. CO. SAND	5	10	40	45	5/2	M	NR	7.5 YR	4/4	6
24			25-26		MOD. SORTED SANDS & GRAVEL ROCK FILL, COBBLES 5-10mm	5	10	30	20	5/2	D	NR	7.5 YR	5/4	
24			27-29		MOD. SORTED SANDS & GRAVEL	5	10	40	20	5/2	M	NR	10 YR	4/3	
24			29-30		CLAYSTONE (DENSE)					10/40	D	VIA	2.5 Y	6/4	7
24			30-32		CLAYSTONE (DENSE)										
24			32-33		CLAYSTONE (DENSE)										
24			33-34		CLAYSTONE (DENSE)										
24			34-35		CLAYSTONE (DENSE)										
24			35-36		CLAYSTONE (DENSE)										
24			36-37		CLAYSTONE (DENSE)										
24			37-38		CLAYSTONE (DENSE)										
24			38-39		CLAYSTONE (DENSE)										
24			39-40		CLAYSTONE (DENSE)										
24			40-41		CLAYSTONE (DENSE)										
24			41-42		CLAYSTONE (DENSE)										
24			42-43		CLAYSTONE (DENSE)										
24			43-44		CLAYSTONE (DENSE)										
24			44-45		CLAYSTONE (DENSE)										
24			45-46		CLAYSTONE (DENSE)										
24			46-47		CLAYSTONE (DENSE)										
24			47-48		CLAYSTONE (DENSE)										
24			48-49		CLAYSTONE (DENSE)										
24			49-50		CLAYSTONE (DENSE)										
24			50-51		CLAYSTONE (DENSE)										
24			51-52		CLAYSTONE (DENSE)										
24			52-53		CLAYSTONE (DENSE)										
24			53-54		CLAYSTONE (DENSE)										
24			54-55		CLAYSTONE (DENSE)										
24			55-56		CLAYSTONE (DENSE)										
24			56-57		CLAYSTONE (DENSE)										
24			57-58		CLAYSTONE (DENSE)										
24			58-59		CLAYSTONE (DENSE)										
24			59-60		CLAYSTONE (DENSE)										
24			60-61		CLAYSTONE (DENSE)										
24			61-62		CLAYSTONE (DENSE)										
24			62-63		CLAYSTONE (DENSE)										
24			63-64		CLAYSTONE (DENSE)										
24			64-65		CLAYSTONE (DENSE)										
24			65-66		CLAYSTONE (DENSE)										
24			66-67		CLAYSTONE (DENSE)										
24			67-68		CLAYSTONE (DENSE)										
24			68-69		CLAYSTONE (DENSE)										
24			69-70		CLAYSTONE (DENSE)										
24			70-71		CLAYSTONE (DENSE)										
24			71-72		CLAYSTONE (DENSE)										
24			72-73		CLAYSTONE (DENSE)										
24			73-74		CLAYSTONE (DENSE)										
24			74-75		CLAYSTONE (DENSE)										
24			75-76		CLAYSTONE (DENSE)										
24			76-77		CLAYSTONE (DENSE)										
24			77-78		CLAYSTONE (DENSE)										
24			78-79		CLAYSTONE (DENSE)										
24			79-80		CLAYSTONE (DENSE)										
24			80-81		CLAYSTONE (DENSE)										
24			81-82		CLAYSTONE (DENSE)										
24			82-83		CLAYSTONE (DENSE)										
24			83-84		CLAYSTONE (DENSE)										
24			84-85		CLAYSTONE (DENSE)										
24			85-86		CLAYSTONE (DENSE)										
24			86-87		CLAYSTONE (DENSE)										
24			87-88		CLAYSTONE (DENSE)										
24			88-89		CLAYSTONE (DENSE)										
24			89-90		CLAYSTONE (DENSE)										
24			90-91		CLAYSTONE (DENSE)										
24			91-92		CLAYSTONE (DENSE)										
24			92-93		CLAYSTONE (DENSE)										
24			93-94		CLAYSTONE (DENSE)										
24			94-95		CLAYSTONE (DENSE)										
24			95-96		CLAYSTONE (DENSE)										
24			96-97		CLAYSTONE (DENSE)										
24			97-98		CLAYSTONE (DENSE)										
24			98-99		CLAYSTONE (DENSE)										
24			99-100		CLAYSTONE (DENSE)										

HOLE ABANDONED

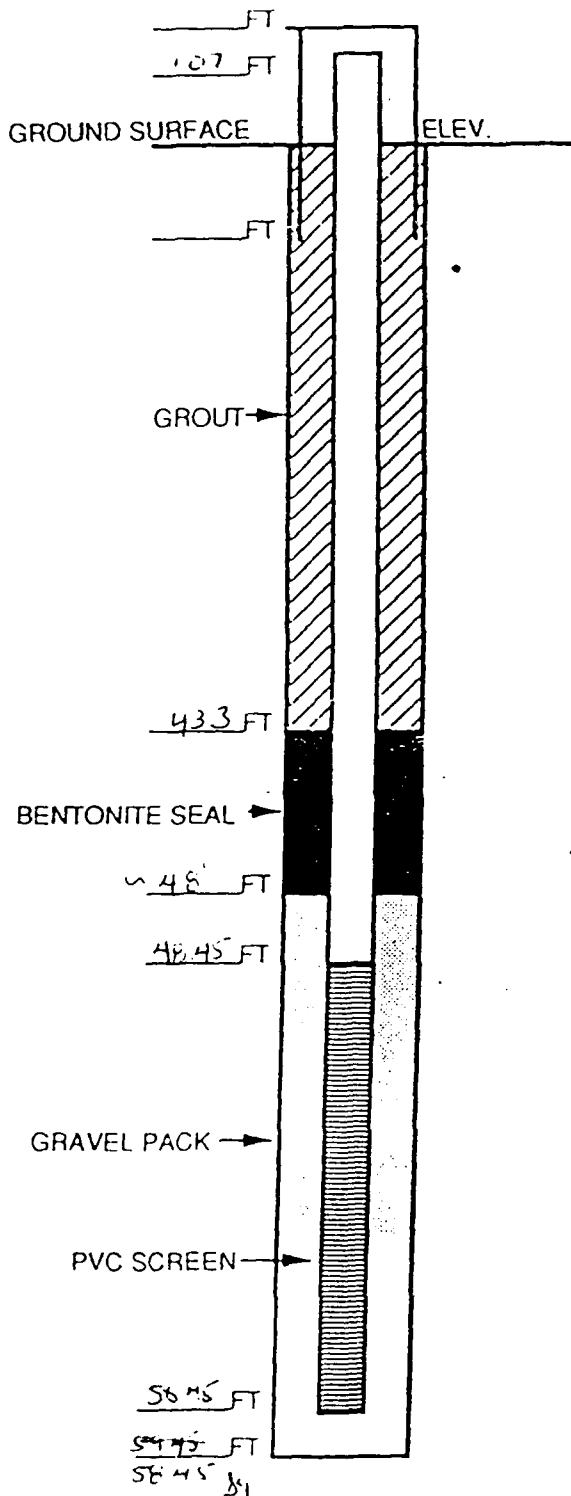
PER ARMY

79301

GROUT FILLED IN

# WELL CONSTRUCTION LOG

Comp 14  
WELL NO. 36173



Measuring point is ground surface unless otherwise noted.

## DRILLING SUMMARY

Total Depth of Hole: 58.45'  
Hole Diameter: 9.25"  
Drilling Company: LAYNE WESTERN  
Driller: DENNIS TAYLOR (HAMMER RIG) / ALAN SINGH (CNC 15)  
Rig Type: TRIMEDNESS / HP 1000 (HAMMER)  
Bits: 3 1/4" ID, 10" OD REAM / HAMMER 9.25" OA  
Geologist: SUSAN GOLDBERG - DIST. MGR. / SETTING WELL

## CONSTRUCTION TIME LOG

	Start		Finish	
	Date	Time	Date	Time
Drilling:	8/20/2	0757	8/20/2	1105
Screen Placement:	8/20/2	1520	8/20/2	1557
Filter Placement:	8/20/2	1557	8/20/2	1625
Seal Placement:	8/20/2	1625	8/20/2	1735
Grouting:	8/20/2	1114	8/20/2	1135

## DEPTH TO WATER

52.95 (BGS)  
Depth: 53.95 Date: 8/21/2 Time: 0810  
57

## WELL CONSTRUCTION MATERIALS

	Grout	Seals	Filter
Quantity:	<u>15</u>	<u>4 BUCKETS</u>	<u>4 BAGS</u>
Type:	<u>TYPE 102</u>	<u>NEW PULVERITY 1/4" BUCKETS</u>	<u>10/20</u>

Screen

Size: .010 Config: HORIZONTAL SPLIT  
Area/Ft.:            Comp: PVC  
Inside Diam.: 4" Outside Diam.: 4"

## COMMENTS

SUSAN GOLDBERG GEOLOGIST PLANNING SET LOG  
JACOB ARMED GEOLOGIST - REAM  
BENTONITE IS CAUSE TO TOP OF SCREEN DUE TO  
IN INADEQUATE MEASUREMENTS BECAUSE DRILLER DID NOT  
REALIZE THERE WAS MORE SAND TO THE POINT WHERE HE STOPPED

EBASCO SERVICES INCORPORATED



THIS WELL WAS

ABANDONED (1974)

LOCATION SKETCH  
OR DESCRIPTION

# FIELD LOG

PAGE 1 OF 2

PROJECT NAME <b>CMP BASIN</b>		WELL ID <b>WELL</b>		WELL NO. <b>2615</b>		NO OF SAMPLES <b>4</b>	
DRILLING COMPANY <b>LAYNE WESTERN</b>		DRILLER <b>RON MUCKEY</b>		DATE/TIME STARTED <b>8/20/74 0757</b>		DATE/TIME COMPLETED <b>1</b>	
DRILLING EQUIPMENT/METHOD <b>CME SS HEMLOCK SIEM ANULER</b>		TOTAL DEPTH <b>44.11</b> cm		INIT. WATER LEVEL <b>DEPT-11</b> cm		24 HR WATER LEVEL <b>---</b> ft <b>---</b> cm	
SIZE AND TYPE OF BIT <b>3 1/4 REG. H. REG.</b>		SAMPLING METHOD <b>SPLIT SPIN</b>		GEOLOGIST (signature/date) <b>Juan S. S. 8/20/74</b>		CHECKED BY/DATE	

DEPTH (ft)	GRAPHIC LOG	WELL CONSTRUCTION	SAMPLE INTERVAL	RECOVERY (cm/cm)	DESCRIPTION (COLOR, TEXTURE, STRUCTURE)	ESTIMATED % OF				USCS ABBREV	MOISTURE	CONSISTENCY	COLOR	SAMPLE NUMBER	
						GRAVEL	SAND								SILT
							CO	MED	FINE						
0-4			4'-4"	100%	VERY FINE SILTY SAND, VERY WELL SORTED, SLIGHTLY CLAYEY + SOME FINE SANDS (SEE FIELD LOG)	0	0	0	100	SM	24		10/2 5/3 Brown	1	
4-8			4'-8"	100%	4-8' SAND, BUT DRY	0	0	0	100	SM	24		10/2 5/4 Brown	2	
8-11			8'-11"	100%	8-11' MED. TO FINE SAND, BUT SOME FINE SAND (SEE FIELD LOG)	0	0	0	100	SM	24		10/2 5/4 Brown	3	
11-14			11'-14"	100%	11-14' SAND, BUT DRY	0	0	0	100	SM	24		10/2 5/4 Brown	4	
14-18			14'-18"	100%	14-18' SAND, BUT DRY	0	0	0	100	SM	24		10/2 5/4 Brown	5	
18-24			18'-24"	100%	18-24' SAND, BUT DRY	0	0	0	100	SM	24		10/2 5/4 Brown	6	

# FIELD LOG

PAGE 2 OF 2

SITE ID: CM014  
26173

DEPTH (ft)	GRAPHIC LOG	WELL CONSTRUCTION	SAMPLE INTERVAL	RECOVERY (cm/cm)	DESCRIPTION (COLOR, TEXTURE, STRUCTURE)	ESTIMATED % OF					USCS ABBREV	MOISTURE	CONSISTENCY	COLOR	SAMPLE NUMBER
						GRAVEL	SAND	SILT	CLAY	SILT					
25					24'-27' SILTY CLAY WITH SMALL SANDY AREAS OF CALC, HARD, LITTLE MOISTURE SOME FINE SAND SOME AMOUNTS OF FELS	0	0	0	100	29	CL	LM		101094 700000 00000	6
30					29'-30.5' SILTY CLAY, NO SAND, EXHIBIT MOIST MOIST, FELS, 1/2 CALC, PUMBLE BUT CRUMBLY	0	0	0	100	29	CL	LM		10112 513 1900000	7
35					30.5'-32' Medium (1/4" - 5/8") SAND WITH SMALL AMOUNTS OF SILT VERY WELL SORTED SUBANGULAR TUMBLING ROCKS	0	0	90	10	10	SP				
40					32'-35' SILTY SAND & GRAVEL PIECES OF GRANITE WELL - VERY WELL SORTED SUBANGULAR - SUBANGULAR SAND GRAINS ARE MOSTLY QUARTZ LOOKS. NO CLAY	10	60	20	10	39	SM	LM		10112 L12 100000 000000 00000	8
45					35'-44' VERY WEATHERED FELSICALLY SAND FINE, 1/2 WELL SORTED LOOKS LIKE A DENVER SAND	0	0	0	100	10	SM	LM		10112 513 300000	9

LOCATION SKETCH OR DESCRIPTION	
	NORTH ROAD A 310 1/4

# FIELD LOG

PAGE 3 OF 3  
 90031

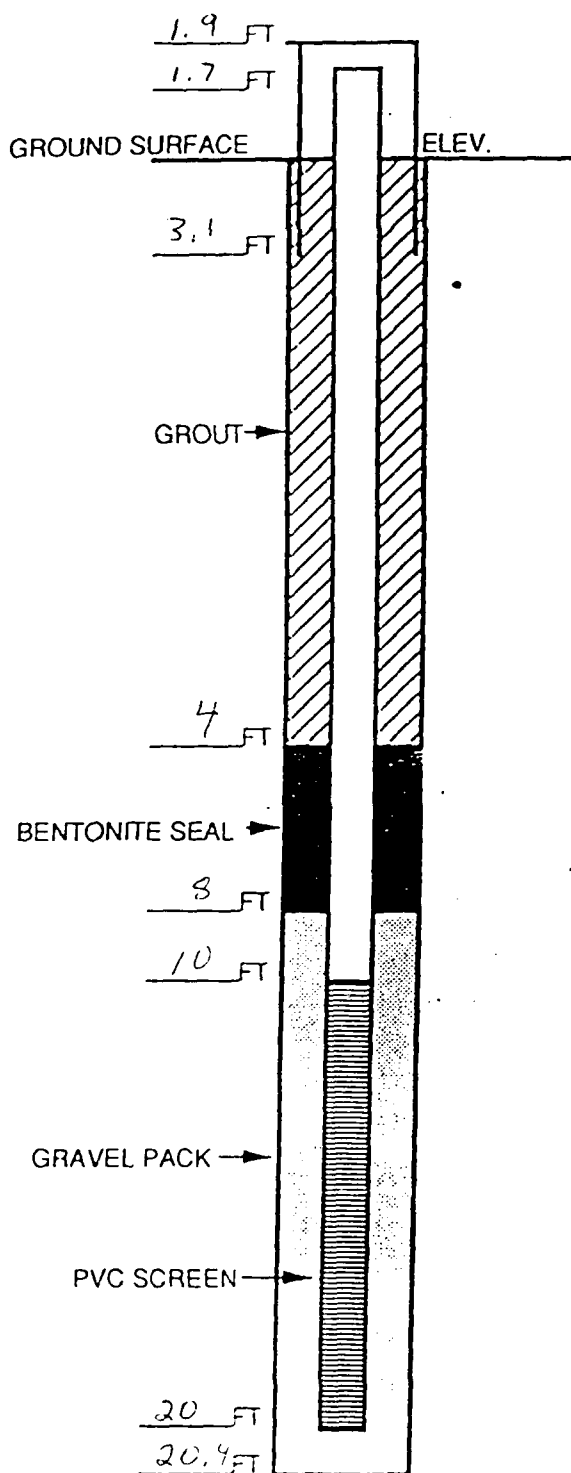
PROJECT NAME RMA Camp Drilling				SITE TYPE well		SITE ID 20173 (CME 14)		NO OF SAMPLES 2	
DRILLING COMPANY Rayne Western				DRILLER John Schoemaker		DATE/TIME STARTED 89225 1 0657		DATE/TIME COMPLETED 89225 1 0904	
DRILLING EQUIPMENT: METHOD CME 55 / CME 75				TOTAL DEPTH 11 ft 52.6 cm		INIT. WATER LEVEL 11 ft 7 cm		24 HR WATER LEVEL 11 ft 7 cm	
SIZE AND TYPE OF BIT 5 1/4 inch		SAMPLING METHOD core barrel		GEOLOGIST (signature/date) Terry Johnson				CHECKED BY/DATE	

DEPTH (ft)	GRAPHIC LOG	WELL CONSTRUCTION	SAMPLE INTERVAL	RECOVERY (cm/cm)	DESCRIPTION (COLOR, TEXTURE, STRUCTURE)	ESTIMATED % OF					USCS ABBREV	MOISTURE	CONSISTENCY	COLOR	SAMPLE NUMBER
						GRAVEL	SAND			SILT					
							COARSE	MED	FINE						
40				47.5 102	44-45.9' - Well sorted sand with good contact with gravelly sand below. 15-18 (60%) of the fraction is smaller. Red leached bands 1" to 1/2" cross intersect the sands at irregular intervals. Strong pinstripe color.	0	0	0	95	5	SP	102	102	45-2	
45					45.9-47.2' - Well graded gravelly sand. Gravel rounded to sub rounded. sand angular to sub angular. Multiple rock types.	10	30	40	10	10	SW	102	102	47	
50					47.2-49' - lost core										
55				48.76 152	49-50.6' - sand gravelly sand as at 45.9' coarse graded fraction greater. Multiple rock types. Degree of mudiness same as at 45.9'. 50.6-54' lost core	10	50	20	10	10	SW	102	102		
60				48.76 152	54-55.6' - sand gravelly sand (well graded) as at 45.9' but darker. 55.6-57.5' lost core	10	50	20	10	10	SW	102	102		
25															

end of split specimen sample

# WELL CONSTRUCTION LOG

WELL NO. 30018



Measuring point is ground surface unless otherwise noted

## DRILLING SUMMARY

Total Depth of Hole: 20 Feet  
 Hole Diameter: 10 inches  
 Drilling Company: Layne- Western  
 Driller: Ron Muckey  
 Rig Type: CME 55  
 Bits: 3 1/2", 9 3/4" Hollow  
 Geologist: Brian Miller

## CONSTRUCTION TIME LOG

	Start		Finish	
	Date	Time	Date	Time
Drilling:	<u>89215</u>	<u>0630</u>	<u>89215</u>	<u>1330</u>
Screen Placement:	<u>89215</u>	<u>0705</u>	<u>89215</u>	<u>0706</u>
Filter Placement:	<u>89215</u>	<u>0708</u>	<u>89215</u>	<u>0830</u>
Seal Placement:	<u>89215</u>	<u>0845</u>	<u>89215</u>	<u>0850</u>
Grouting:	<u>89215</u>	<u>0850</u>	<u>89215</u>	<u>1000</u>

## DEPTH TO WATER

Depth: 13.8' Date: 89215 Time: 1005

## WELL CONSTRUCTION MATERIALS

	Grout	Seals	Filter
Quantity:	<u>2 Bags (#4)</u>	<u>3 Buckets</u>	<u>4 bags</u>
Type:	<u>Portland Cement</u>	<u>1/4" Pellets</u>	<u>10/20 silica sand</u>
	Screen		
Size:	<u>0.010"</u>		
Area/Ft.:	<u>-</u>		
Inside Diam.:	<u>4"</u>	Config:	<u>horizontal slot</u>
		Comp:	<u>PVC (Schedule 40)</u>
		Outside Diam.:	<u>4"</u>

## COMMENTS

R. L. STOLLAR & ASSOCIATES, INC.

# FIELD LOG

PAGE 1 OF 1

**LOCATION SKETCH OR DESCRIPTION**

N ↑

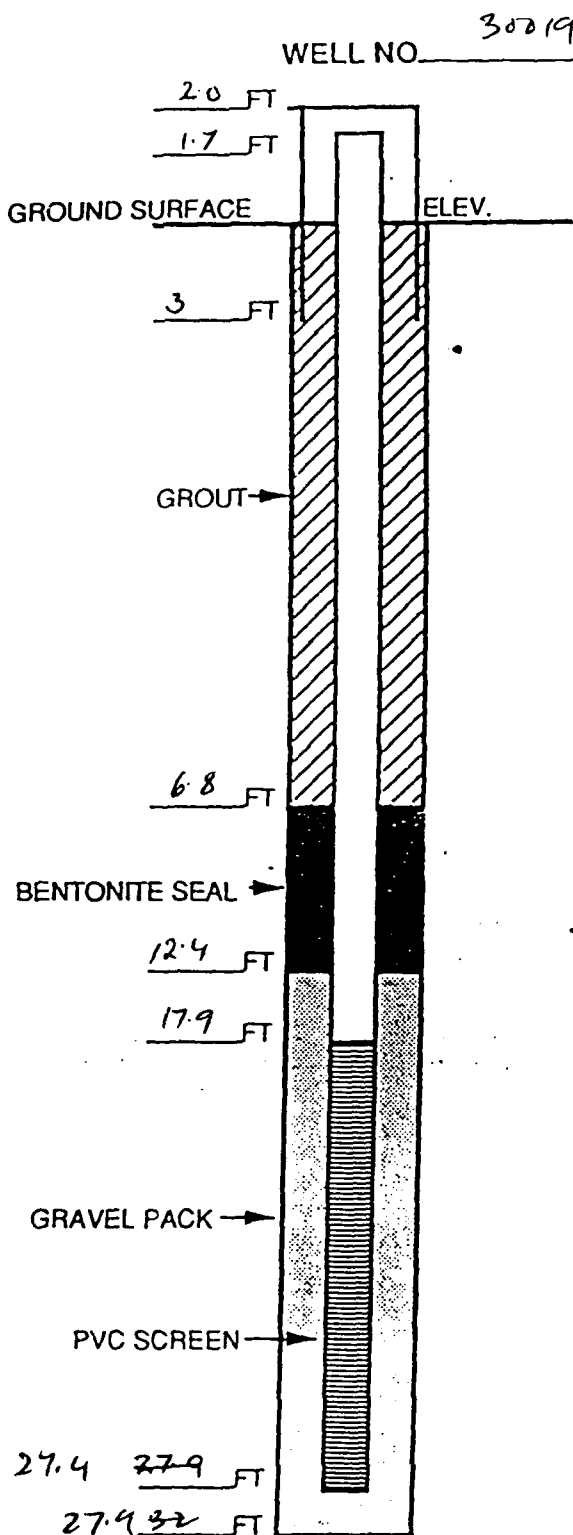
30618

Sec 31

Landfill

[illegible]

# WELL CONSTRUCTION LOG



## DRILLING SUMMARY

Total Depth of Hole: 32.0 ft

Hole Diameter: 10'

Drilling Company: Dayco Wells

Driller: Ron Muehly

Rig Type: Eme-55

Bits: 3 1/4 Pilot ID. 6 1/2

Geologist: Tony Ahn

## CONSTRUCTION TIME LOG

	Start		Finish	
	Date	Time	Date	Time
Team	89207	0700		
Drilling:	<u>89206</u>	<u>1025</u>	<u>89206</u>	<u>1025</u>
Screen Placement:	<u>89207</u>	<u>0812</u>	<u>89207</u>	<u>0812</u>
Filter Placement:	<u>89207</u>	<u>0825</u>	<u>89207</u>	<u>0825</u>
Seal Placement:	<u>89207</u>	<u>0830</u>	<u>89207</u>	<u>0830</u>
Grouting:	<u>89207</u>	<u>0860</u>	<u>89207</u>	<u>0860</u>

## DEPTH TO WATER

Depth: 24.3 Date: 89207 Time:

## WELL CONSTRUCTION MATERIALS


	Grout	Seals	Filter
Quantity:	<u>8 bcp (#47) 66</u>	<u>3 1/2</u>	
Type:	<u>Portland</u>	<u>1/4" Taper</u>	
	<u>Type Screen</u>	<u>Valley</u>	
Size:	<u>10</u>	Config:	
Area/Ft.:		Comp:	
Inside Diam.:		Outside Diam.:	

## COMMENTS

Measuring point is ground surface unless otherwise noted.

REPRODUCED FROM ORIGINAL RECORDS

# FIELD LOG

LOCATION SKETCH OR DESCRIPTION


[illegible]

## FIELD LOG

PAGE 2 OF 2

SITE ID: 38079

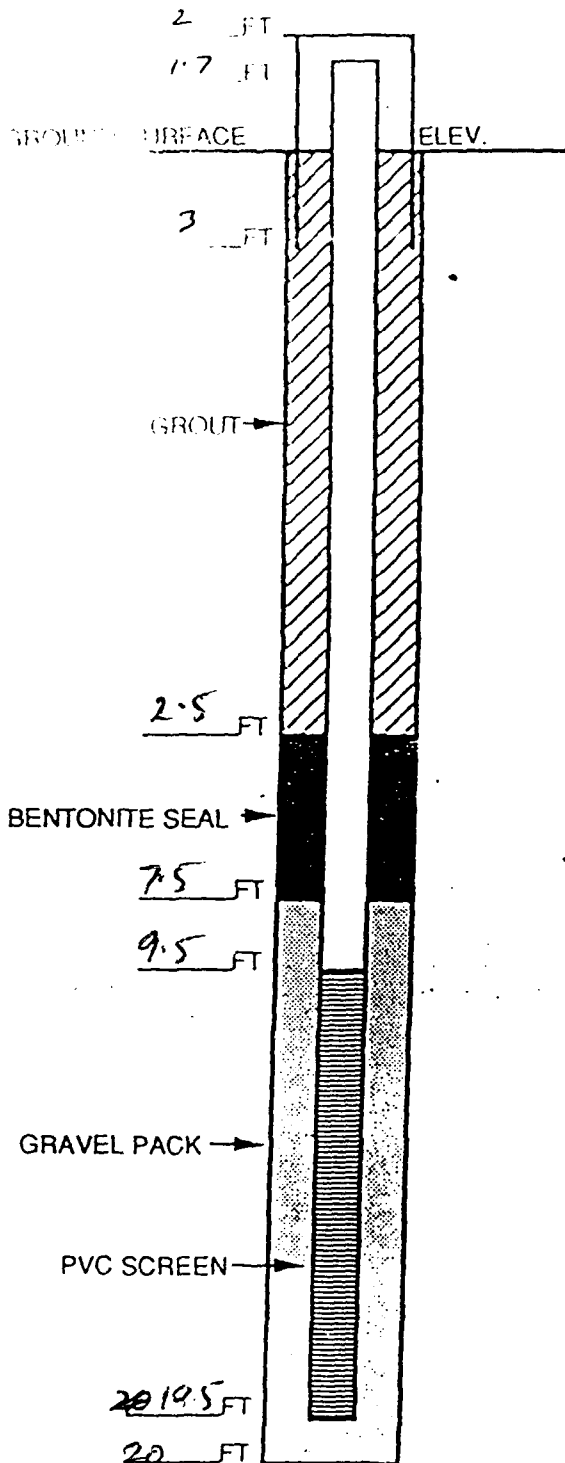
[illegible]

$\xi$  = Fracture & Dissociation. Perpendicular to core length



# WELL CONSTRUCTION LOG

WELL NO. 30020



Measuring point is ground surface unless otherwise noted.

## DRILLING SUMMARY

Total Depth of Hole: 20'  
 Hole Diameter: 10" Ream  
 Drilling Company: Loupe Western  
 Driller: Ron Muckey  
 Rig Type: CME-55  
 Bits: 3 1/4" ID Pilot / 6 1/4" ID Ream  
 Geologist: Tareq Ahmad

## CONSTRUCTION TIME LOG

	Start		Finish	
	Date	Time	Date	Time
Reaming	89207	1700	89207	1330
Drilling:	89207	1156	89207	1250
Screen Placement:	89208	0642	89208	0645
Filter Placement:	89208	0648	89208	0705
Seal Placement:	89208	0706	89208	0708
Grouting:	89208	0724	89208	0751

## DEPTH TO WATER


Depth: 14.8 Date: 89207 Time: 1220

## WELL CONSTRUCTION MATERIALS

	Grout	Seals	Filter	(#50)
Quantity:	282 lbs cement	1/4" Pellets	5 lbs	56 p
Type:	14 lbs Bentonite	Volclay	100 lb	100 lb
		154 lbs cement	100 lb	100 lb
		100 lb	100 lb	100 lb
Screen				
Size:	10	Config:	100 lb	100 lb
Area/Ft.:		Comp:	Schmidt	100 lb
Inside Diam.:		Outside Diam.:		

## COMMENTS

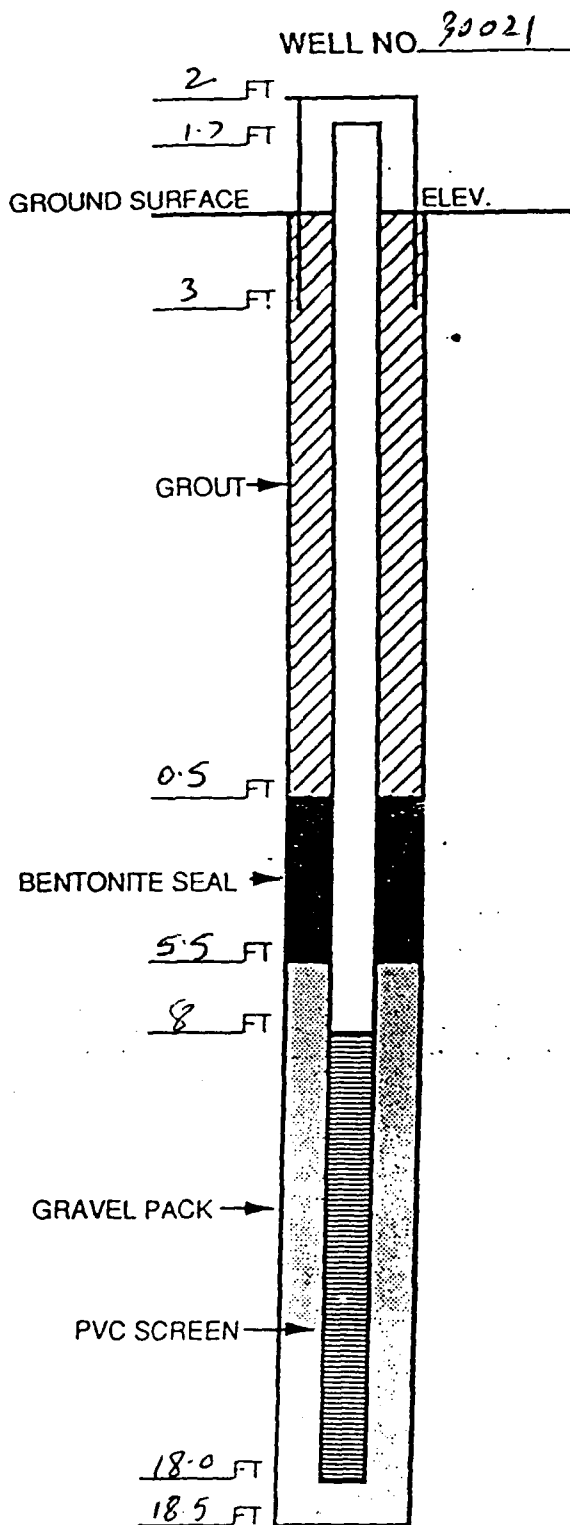
EBASCO SERVICES INCORPORATED

<p><b>LOCATION SKETCH OR DESCRIPTION</b></p> 
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PAGE 1 OF 1

[illegible]

# WELL CONSTRUCTION LOG



Measuring point is ground surface unless otherwise noted.

## DRILLING SUMMARY

Total Depth of Hole: 18.5  
Hole Diameter: 10" Ream  
Drilling Company: Layne Western  
Driller: Ron Muekey  
Rig Type: Cmc-55  
Bits: 3 1/2 Bit / 8 1/4  
Geologist: Tony Ahmed

## CONSTRUCTION TIME LOG

	Start Date	Start Time	End Date	End Time
Drilling: <u>Ream</u>	<u>89208</u>	<u>0931</u>		
Screen Placement:	<u>89208</u>	<u>1118</u>		
Filter Placement:	<u>89208</u>	<u>1126</u>	<u>89208</u>	<u>1155</u>
Seal Placement:	<u>89208</u>	<u>1155</u>	<u>89208</u>	<u>1211</u>
Grouting:	<u>89208</u>	<u>1251</u>		

## DEPTH TO WATER


Depth: 11 Date: 89208 Time:

## WELL CONSTRUCTION MATERIALS

	Grout	Seals	Filter
Quantity:	<u>One bucket</u>	<u>3 buckets</u>	<u>2 bags (40 lbs)</u>
Type:	<u>Portland</u>	<u>44 teckin</u>	<u>Generic/Unbranded</u>
Screen			
Size:	<u>10'</u>	Config: <u>10864</u>	
Area/Ft.:		Comp: <u>Subsided 40' PVC</u>	
Inside Diam.:		Outside Diam.:	

## COMMENTS

EBASCO SERVICES INCORPORATED

LOCATION SKETCH OR DESCRIPTION


30021

[illegible]

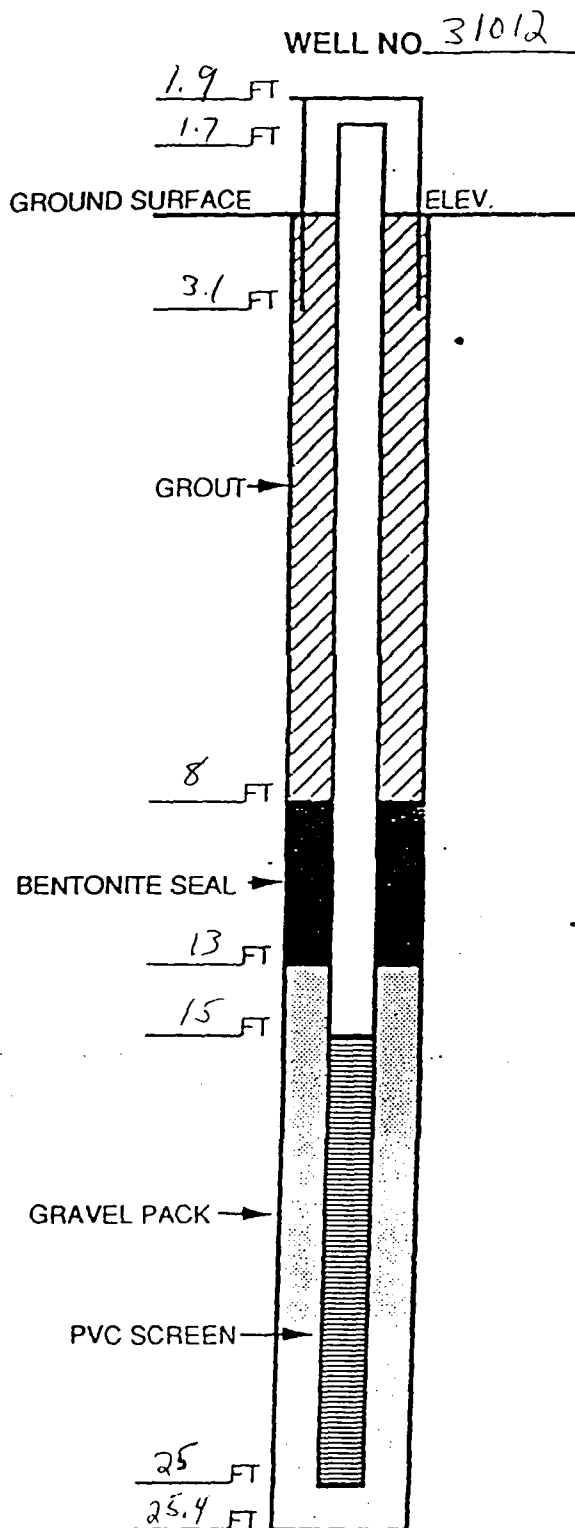
## FIELD LOG

PAGE 2 2

**SITE ID:**

[illegible]

# WELL CONSTRUCTION LOG



Measuring point is ground surface unless otherwise noted.

## DRILLING SUMMARY

Total Depth of Hole: 30 FT  
Hole Diameter: 10 inches  
Drilling Company: Seque - Western  
Driller: Ken Muckey  
Rig Type: CME 55  
Bits: 10 inch hollow  
Geologist: Brian Myller

## CONSTRUCTION TIME LOG

	Start		Finish	
	Date	Time	Date	Time
Drilling:	89215	1130	89216	0740
Screen Placement:	89216	0825	89216	0830
Filter Placement:	89216	0840	89216	0855
Seal Placement:	89216	0905	89216	0910
Grouting:	89216	0915	89216	1000

## DEPTH TO WATER

BM 89216 45' 89216  
Depth: 19.6' Date: 8/4 Time: 1000

## WELL CONSTRUCTION MATERIALS

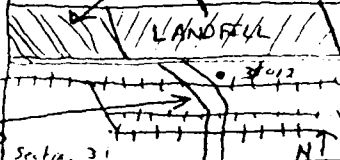
	Grout	Seals	Filter
Quantity:	4 Bags	3 Buckets	4 Bags
Type:	Portland Cement	1/4 pellets	10/20 S. 1/2 in. sand
	Screen		
Size:	C.P. 10		
Area/Ft.:	—		
Inside Diam.:	4"	Config:	Horizontal Slot
Outside Diam.:	4"	Comp:	PVC (Schedule 40)

## COMMENTS

## FIELD LOG

PAGE 1 OF 2

Location Sketch

LOCATION SKETCH  
OR DESCRIPTION

PROJECT NAME RMA/LMP Sanitary Landfill Upgradation		SITE TYPE Well	SITE ID 31012	NO. OF SAMPLES 1
DRILLING COMPANY Layne - Western	DRILLER Ron Mackey	DATE/TIME STARTED 8/21/5 1130	DATE/TIME COMPLETED 8/21/6 1130	
DRILLING EQUIPMENT: METHOD CME SS: Hollow Stem Auger		TOTAL DEPTH 30 11 914 cm	INIT. WATER LEVEL 19 11 579 cm	24 HR WATER LEVEL 19.6 11 577 cm
SIZE AND TYPE OF BIT 3 3/4" hollow stem	SAMPLING METHOD Split Spoon	GEOLOGIST (signature/date) Brian Myller		CHECKED BY/DATE

DEPTH (ft)	GRAPHIC LOG	WELL CONSTRUCTION	SAMPLE INTERVAL	RECOVERY (cm/cm)	DESCRIPTION (COLOR, TEXTURE, STRUCTURE)	ESTIMATED % OF					USCS ABBREV	MOISTURE	CONSISTENCY	COLOR	SAMPLE NUMBER
						GRAVEL	SAND			SILT					
							COSE	MED	FINE						
0					Brown sandy silty clay. Consolidated and fractured for top 2' ft.	-	-	10	20	70	CL	0.7	HR	10YR 3/3	
4.0					Grading to clayey silty sand									LM	10YR 4/3
5.0															
4.7					Grading to clay with coarsening sand. Increasing moisture, decreasing consolidation with depth.	-	-	30	20	50	SC	mm			10YR 4/6
5.0					Same as above with caliche added in 1 foot layer.										10YR 5/6
4.7					Increasing clay immediately beneath caliche layer.	-	-	30	30	40	SC	mm			10YR 3/3
5.0					Increasing clay again with caliche zones, approx. 3" thick, randomly distributed	-	-	30	20	50	SC	mm			
4.7					Clay suddenly stops: Dark Yellowish brown Sand	-	-	70	30	-	SP	mm			10YR 5/6
5.0					Clay begins grading back in. Caliche zones appear again. Clayey Sand			20	20	60	CL	mm			
4.5					Sandy Clay	-	-	20	20	60	CL	mm			
5.0					STAINED INTERVAL FROM 18.6' to 18.9' consists of black, moist, coarse sand. No H+S. Sandy clay, no longer black.	-	-	30	20	50	SP	mm			10YR 2/1
3.6					Clay decreasing w/ depth			10	30	60	CL	mm			10YR 3/3
5.0					Clayey Sand. Auger Refusal at 23'. Driller Indicates Gravel. Remove split spoon, replace with center bit. Advance with center bit 2'. No sample obtained from 23 to 25.										10YR 4/4
25					Driller indicates Gravel from 23 to 24.5										

BM 87215

CMP

SITE ID: 31012

[illegible]